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PERMISSIBLE LOAD ON A BRANCH CIRCUIT.

The practice of limiting the number of sockets or receptacles on branch lighting circuits to twelve came about when the carbon-filament lamp was the only unit employed in electric incandescent lighting. Since 660 watts was to be the maximum load generally allowed on the branch circuit and the 16-candle-power, 55-watt lamp was the one usually employed there, twelve sockets or receptacles was naturally the proper maximum. It is not so clear, though, why the load was ever limited to so small a maximum wattage; the safe carrying capacity of No. 14 rubber-covered wire is 12 amperes, which is just twice the current taken by a 660-watt load on a 110-volt circuit, and twice that for which the present National Electrical Code permits 110-volt branch circuits to be fused. Perhaps the maximum was kept at this low figure in the belief that a six-ampere fuse was the largest one that could be depended upon to protect a piece of flexible cord carrying a pendent lamp, this sort of construction having been very prevalent in the earlier days of incandescent lighting.

Whatever the reason for making the maximum permissible load on the branch circuit so small may have been, it is a fact that it is now exceedingly difficult for the electrical inspector to make sure that the 660-watt limit will not be exceeded, since incandescent lamps with standard bases in sizes as large as 250 watts are available on every market and the use of electric heating devices on branch circuits is common practice. More than a few of the best inspection departments in the country have for some time past been permitting the use of 10-ampere fuses in branch circuits, regardless of the Code prohibition of such a procedure. It would seem that a general change in the direction of permitting a larger number of sockets on the circuit would be equally timely and appropriate. Under present conditions, reducing the number even to five or six would afford but little assurance that the circuit would not be overloaded; on the other hand, increasing the maximum allowable number so that the 660-watt load could be obtained with 40-watt or with 25-watt lamps would be a great convenience in buildings of many types. As is noted elsewhere, the municipal inspection rules in New York City have just been amended to allow more sockets to the circuit. This is a change which other inspection departments have equal reason to consider.

CENTRAL-STATION WORK AND THE TECHNICAL GRADUATE.

The central station as a field for the technical graduate seems to have received less attention than the electric railway, the telephone industry and the manufacturing side of the electrical art, possibly because the number of employees required to handle a given gross yearly business is relatively small, and again, because the work of the central-station man is to a large extent "behind the scenes" in human affairs. At this time of year technical graduates are seeking openings from one end of the country to the other, and while many go directly from the engineering school into previously secured positions, others are undecided, and even if located for a while, often require time to fit into the places for which they are best qualified. The central-station industry needs fresh blood and the youthful point of view as much as any other and should be given consideration.

Fundamentally, central-station work rests upon the commercial problem of selling electrical service to the general public, and the man with a bent toward technical salesmanship is likely to find his opportunity in this field. Even in cities where electricity is purchased at the rate of $10 per capita per year, the field is by no means fully cultivated, and there is as yet no sign of reaching the limit of absorbing power from the popular standpoint. For a good many years to come the central-station field will offer the man of combined technical and commercial ability an attractive opportunity for practical service. There are clearly openings for purely technical men in the economical operation and maintenance of the generating plant and distributing system; for the man with a taste for accounting and for the lawyer with engineering training—rare but useful individual; but the backbone of the central-station industry is commercial. The highly trained young bachelor of science may perhaps look upon these selling duties as less professional and less in line with his education—until a few years' experience teaches him better, but all the progress of the electrical industry along applied lines is a business matter and the money test of the merits of a proposition to install motors in an underwear factory may be of as much engineering importance as a test made by the technical specialist upon a new type of line insulator.

Looking at the broader problems of electric lighting, power and heating service, the opportunity for original and profitable work at present seems almost unlimited. It is nothing less than wonderful that the field of electrical applications continues to widen the more it is cultivated, and this field is so closely related to adequate money rewards that it is certainly one of the very best for the young man to enter today. It demands progressive, catholic methods and viewpoints, calls upon the best mental resources, and is varied beyond the dreams of earlier workers in the art. Research is being given more and more support in the manufacturers' laboratories and the outcome is constantly enjoyed in the form of new apparatus for the lightening of human toil.

No branch of the electrical art is so inclusive as central-station work and the young man who enters this field with eagerness to make the most of his opportunities, however humble they may be at first, is not likely to stay in the lower ranks an undue length of time.

ENGLISH ELECTRIC SUPPLY PROBLEMS.

Several hundreds of British municipal electrical engineers and committeemen assemble annually in the month of June in some part or other of the United Kingdom. This year the gathering took place in London, during the present week.

The program for the convention of the Incorporated Municipal Electrical Association usually bears on its surface a rough indication of the problems that have recently been occupying the minds of electric supply authorities, or that may be expected to loom largely among their affairs before long. Since last year's meeting the outstanding development has been in connection with electric heating and cooking and in addition to a discussion on the matter at the association meeting, arrangements were made for an effective exhibition of such apparatus. The growing policy of adopting such charges for current for cooking as would win the people, brought into existence at one of these conventions the "Point Fives" Club. The membership of this select circle has grown to fourteen and that it is something more than a mere fad is obvious from its proceedings and from its ability to call a meeting at the Institution of Electrical Engineers in London in June.

The position of municipal electric supply men in relation to electric wiring and installation work has undergone a change consequent upon both litigation and legislation, and electrical contractors in England are thought to be able to sleep more securely in their beds because they have less fear of the municipal power plants unfairly competing with them. No doubt some chief engineers and managers are only too glad to be rid of the controversy, though others will wish for it or something else to promote or maintain a keen business-seeking spirit on the part of the private contractor.

But though some old questions assume an altered aspect, there are of necessity new ones arising in so progressive a business as electricity supply. In England the electric vehicle is, from whatever cause, deplorably behind, and of late there has been a welcome spirit of discontent and restlessness in this direction. A number of central-station managers have endeavored to create a live interest in the matter, and some of them have been trying to impress upon their directors how necessary it is to proceed along an enlightened way in order to encourage so

excellent a load. Of course this is really an old question, but it was new to the English convention this year, and with the object of making the occasion as effective as possible there was a demonstration of electric vehicles and a paper on the subject.

Dr. Ferranti, whose work on the gas turbine was referred to in these pages on February 8, presented a brief summary of the present status of prime movers, showing that in practice the turbine system has proved its ability to meet the demand that is made on power-producing plant. This paper will be found elsewhere in this issue. Looking at the question in the light of possible developments of the future, he believes that as long as engines are used the rotary principle will be followed.

Another feature of recent development in English electric supply which should be noted is the movement that has taken place on a quite extensive scale for organizing subordinate power and substation employees into an Association of Central Station Engineers. Already local sections have been formed in different parts of England as well as a strong central body in London. The many thousands of electrical workers of these and similar classes have shown an interest and keenness in this movement to redress grievances and generally to raise their status, which may fairly be described as phenomenal.

A CONTRIBUTION TO THE LOAD-FACTOR.

Anything that can be done to distribute the load upon a central station more evenly over the 24 hours will help to diminish the unit cost of energy. No opportunity should be lost, consequently, to fill up the valleys of the load curve and shave off the peaks.

The load curve of almost every central station shows a deep depression about noon, owing to the fact that a great deal of machinery is shut down at this time, when the operatives are getting the midday meal. While the interval of this depression seems small, it represents in the aggregate a considerable diminution in the total consumption. In many plants using central-station power it would be quite feasible to limit the lunch period to a half hour, and close down in the afternoon a half hour earlier than is now customary. This would not alter the working time or the total consumption of energy, but would result in throwing the load forward so as to utilize the capacity of the generating equipment in the middle of the day and relieve it somewhat at the late afternoon hour when the winter peak is usually experienced.

While this proposal would undoubtedly meet with opposition in a great many shops using central-station power, there are others where it would be cordially received, and a suggestion from the central station might result in bringing it about. From the point of view of operatives whose labor is not physically arduous and in whose work the longer period of rest is not imperative, it would be a great advantage, as better use of the half hour could probably be made in the late afternoon than at the lunch period.

SUMMER POWER BUSINESS.

Central-station companies all over the country have been making steady progress in securing as customers manufacturing plants which previously found it necessary to operate their own prime movers for generating power. This has been due in part to consistent activity on the part of new-business departments and partly to the fact that central-station service steadily improves in reliability, cost, continuity of operation and other elements of satisfactory service.

Nevertheless, there is still much to be accomplished in furthering centralization of power generation. Many owners of isolated plants have believed that it was more economical for them to generate their own power, and this is especially the case where the heating question enters into consideration. Exhaust steam is very generally used for heating purposes in connection with such plants during the winter months. However, in view of the fact that the steam demand for heating disappears altogether in the summer, and in the winter is not at all coincident with the demand for electricity, it is readily seen that the utilization of exhaust steam for heating in isolated plants is not nearly as great a factor in economy as is claimed. It is true that some plants do operate at a high efficiency during the heating season, but it seems that even when this condition exists, wastes are tolerated during the remainder of the year simply to operate economically during the comparatively brief heating season.

Such plants as these form ideal customers for central-station companies desiring to increase their summer load. The expense of making service connections to these plants is very small and often such summer service proves so satisfactory that the isolated plant is entirely abandoned. In Detroit, an active campaign is under way for business of this class. In one of its advertisements the Edison Illuminating Company sums up the arguments in this way: "A steam plant cannot be operated economically during the summer season when heat is not required, nor can it be operated with comfort to the workers in the factory or office building. Why not shut down your plant during the warm months, operate it with our service and learn what ideal operation of a plant is? If your plant needs repairing do not close your shop or pay double price for Sunday or overtime work. Use our service while alterations are in progress."

Too little attention has been given to these phases of power service in the past. It is not unusual to find prohibitive rates in existence for emergency and breakdown service. Certainly the subject is worthy of more serious consideration from an advertising standpoint at least.

Annual Meeting of New York Electrical Society.

The New York Electrical Society held its annual meeting for the election of officers at the Woolworth Building, 233 Broadway, New York City, on Thursday, June 12. The officers elected were: president, H. H. Barnes, Jr.; vice-presidents, S. S. Edmands, A. H. Lawton, Carl Schwartz; secretary, George H. Guy; treasurer, Henry J. Hoeltge.

After the election, Charles E. Knox gave an address on the electrical features of the Woolworth Building. The 300 members present were then conducted through the engine room, the elevator dispatcher's gallery, and the high-rise machinery room, and finally carried to the top of the tower to enjoy the magnificent view therefrom.

The secretary's report showed that 166 members had been elected during the season, the largest ever added to the membership in a single season. The membership is now 804. The report dwelt on the new activity which has been brought into the Society by the generous gift of Willard E. Case and Henry L. Doherty of $1,500 towards a publicity fund. This has enabled the Society to do a great deal towards laying the foundation of a wider development than has hitherto been possible.

The Society has a splendid program for the coming esason, and one which will more than maintain the Society's reputation for interesting as well as instructive meetings.

One of the features of the meeting was the presentation of a silver cup to Guy V. Williams, who has the best record for the season in securing applications for membership. Mr. Williams secured 19 new members. This cup was offered at the beginning of the season by a prominent member of the Society for a membership contest.

The Society has begun this year publishing *Transactions* which contain papers which have been presented at its meetings. This, together with the policy of visiting meetings, which has been put into operation during the past season, has greatly stimulated interest in the Society and has aroused much enthusiasm for it.

Meeting of Utility Employees.

The Employees Booster Club, composed of men connected with the United Gas & Electric Company, of New Albany, Ind., and associated public utilities, closed a successful year's work preceding a summer vacation by an interested meeting held at the company offices recently. The meeting was featured by an address by Chester P. Wilson, who recently became president of the companies, which are controlled by the Middle West Utilities Company of Chicago. Mr. Wilson emphasized the value of co-operation in public-service work, and complimented those who had taken active parts in making the club of value to the companies and the community.

Cedarmen's Outing.

On Saturday evening of last week two special cars carried members of the Northwestern Cedarmen's Association and their guests to Blackduck, Minn., for a two days' outing. One of these cars, *The Advance*, came from Chicago, and contained J. C. Kirkpatrick, of the National Pole Company, Escanaba, Mich., as host, and Russell A. Griffin, F. A. Carpenter, and a party of friends from the east. At Minneapolis, H. S. Gilkey, of Pendleton & Gilkey, joined the party in this car.

The other car, the *Kabekona*, contained the following: W. C. Moss, H. F. Partridge, T. M. Partridge, N. E. Boucher, L. A. Page, Jr., C. L. Hamilton, M. J. Bell, F. B Wessenberger, James E. Kinny, J. R. Kolliner, E. L. Clark, J. W. Benham, M. Callahan, R. H. Ross, L. A. Furlong and G. H. Warner. At Bemidji this car picked up J. T. Naugle and H. M. Clark.

When the party reached Blackduck they became the guests of the cedarmen and at Sunday dinner were entertained at the home of A. L. Witting, where an elaborate meal was served on specially prepared tables in the open air.

The various activities of the party during their stay consisted of a dance, a baseball game, the above dinner at Blackduck, fishing, automobile rides and a tour of inspection up the line on a special train. Stops were made at Kelliher, Mizpah and at the immense pole yards of the National Pole Company, at Gimmell. A business meeting was held at Blackduck, where matters that had come up since the annual meeting were discussed. The party left Blackduck Monday night for the return trip.

Joint Outing of Philadelphia Sections.

The Philadelphia sections of the American Institute of Electrical Engineers and the Illuminating Engineering Society held a joint outing on the afternoon of June 7 on the grounds of the Athletic Association of the Philadelphia Electric Company. There were about 100 present.

A baseball game between the nines representing the two sections resulted in a tie. After this game a talk was given by W. S. Franklin, professor in physics at Lehigh University, on the subject "Baseball Curves."

Supper was served on the lawn and music was furnished by the Philadelphia Electric Company orchestra.

Railway Signal Association Meetings.

A meeting of the Railway Signal Association was held at the Hotel Astor, New York, on June 11 and 12. Sessions were held each morning and afternoon, and the reports of committees on mechanical interlocking, power interlocking, automatic block signaling, manual block signaling, electric railway and alternating-current signaling, storage battery and charging equipment, and standard designs were discussed and approved for submission to the annual convention. Two papers submitted by J. E. Saunders entitled respectively, "Motor Generators for Use as Frequency Changers," and "Twenty-five Versus Sixty-Cycle, Alternating-Current Power for Railway Signaling," were received as information and will not be brought up again for discussion. An abstract report recommending that these papers be received as information and published in a book later on containing subjects of this character, will be presented. The meeting was well attended and a number of manufacturers of insulated wire were present, including Capt. W. L. Candee and Lewis G. Martin, of the Okonite Company; R. D. Brixey, of the Kerite Company. George Lockwood, of the Brookfield Glass Company, was also a prominent attendant.

New York Electrical Exposition.

The seventh annual electrical exposition and motor show in New York City will be held in the Grand Central Palace from October 15 to 25 inclusive.

It is hoped that the exposition this year will include examples of every known use for electric energy. It is proposed to have a complete representation of recent progress in electrotherapy. Light, heat and power in the home, and the use of electricity in connection with office appliances, will receive particular attention.

Safety and sanitation, electric vehicles, and electricity on the farm will receive detailed attention, and Thomas A. Edison has promised a personal exhibit of great historical and general interest.

There will be government exhibits by the Departments of Agriculture, Interior, Commerce and Labor, War, Navy and Treasury, and also by the Isthmian Canal Commission. The state of New York will be represented by a model of the electrically operated siphon lock to be installed on the Barge Canal.

Exhibit spaces will be supplied with both direct and alternating current, the latter to be either single or two-phase. Floor plans of the exhibit space and contract blanks can be obtained from the president, Arthur Williams, 124 West Forty-second street, New York City.

T. I. Jones.

Theodore Inslee Jones, the newly elected chairman of the Commercial Section of the National Electric Light Association, is general sales agent of the Edison Electric Illuminating Company of Brooklyn and has been for the past year vice-chairman of the Commercial Section. He is also chairman of the Commercial Section Electrical Merchandising and Finance Committees of the National Association.

Mr. Jones is an electrical engineer, graduating from the Massachusetts Institute of Technology with the degree of Bachelor of Science in the Department of Electrical Engineering in the class of 1896.

In that year he began work in the New York office of the American Telephone & Telegraph Company, being identified with the Inspection and Executive Departments. While there, he originated and equipped the first school of instruction for telephone traffic, writing the first book of instruction for handling long-distance business. This has since become an important adjunct of all telephone companies' work.

Leaving the telephone field in the early part of 1907, Mr. Jones accepted a position as illuminating engineer with the Nernst Lamp Company in New York, and while in this position was called upon to organize the sales department of The United Electric Light & Power Company of New York, becoming its first sales manager.

After two years' work with the United Company, he was invited to take charge of the sales activities of the Brooklyn Edison Company, which position he accepted in September, 1909. He reorganized the department, including from that time the advertising and old-building work, which had until then been conducted separately from the selling organization. In less than four years, under Mr. Jones's direction, the sales department has written business amounting to approximately 3,033,472 50-watt equivalents, increasing the company's gross income from $3,700,000 during 1909 to $5,200,000 during 1912.

Since the present organization of the sales department, over 200 private plants have been replaced in Brooklyn by Edison service.

Mr. Jones has written a number of papers which have been presented before the conventions of the National Electric Light Association and the Association of Edison Illuminating Companies. Among these papers may be mentioned, "Functions of a Sales Department," "Development of Revenue from Existing Customers," "Canvassing by Telephone," "Selling Electricity" and "Instrumental Methods of Measuring Maximum Demand."

He is past statesman of the Jovian Order, New York district, and is a member of the American Institute of Electrical Engineers, the Illuminating Engineering Society, the New York Electrical Society and the Manufacturers' Association of New York. He is also a member of the Technology Club of New York, the Crescent Athletic Club of Brooklyn and the Long Island Automobile Club.

Theodore I. Jones,
Chairman of Commercial Section, National Electric Light Association.

Boston Edison Dinner.

The Installation Department of the Edison Electric Illuminating Company, of Boston, held a dinner at Hotel Thorndike, Boston, June 11. Joseph W. Cowles, superintendent of the department, was toastmaster, and several speakers discussed various phases of practical work, among them being J. C. Norcross, Henry Moise, C. H. Ingalls, Jesse Wilkinson and F. A. Keuhl.

Overhead-Wire Regulations in England.

The British Board of Trade has issued revised model regulations relating to high-pressure overhead lines. There are two codes, as previously, one for direct voltages up to 650 and alternating up to 250, the other being for higher pressures. Modification has been made in the memorandum for guidance of applicants for consents for overhead wires. Specified points have to be stated and the regulations are made for each case separately on its merits after consideration. An effort has been made to separate the variables from the constants, the former emanating from the applicant and the latter constituting the regulations, thus enabling a more difficult code to be used than before. These variables include working voltage; the kind of wire—whether copper or aluminum, solid or stranded; its sectional area, tensile strength and elongation; the average and maximum length of span; the minimum height of wires from ground; and the name or description of any automatic protective device used.

Among the chief alterations in these regulations is the reduction of the wind pressure from 30 to 25 pounds per square inch, which is very favorable compared to practice on the European Continent. Two new regulations are in the high pressure code, one of which requires precaution to be taken against accident due to contact between a wire and a tree. It is not always practicable to clear away trees on each side of a transmission line as in other countries, as rights of way are difficult to obtain in England. Contact with a tree may fuse a wire and let it fall.

The other new regulation prohibits the carrying of high-pressure wires across the premises of a consumer except under special conditions. The way to escape from such conditions is to terminate the overhead wires at the boundry of the premises. There is alteration in the regulation for having a continuous earth wire carried from pole to pole—which is the general practice—or the ironwork on each pole must be connected to a substantial earthplate.

The method of crossing roads is

not prescribed, being left to the applicant to submit his details for approval. Some years ago guard wires were abandoned and one of the recent codes suggested the strengthening of the weakest points by duplicating all the insulators.

Marconi to Inspect Belmar Station.

Guglielmo Marconi, the wireless telegraph inventor, arrived at New York on June 11 to inspect the new transatlantic wireless station being constructed at Belmar, N. J., and also to give evidence in the suit of the Marconi Company against the National Electric Signaling Company for alleged infringement of its patents.

Speaking of the new station at Belmar, which is to be opened in the fall, Mr. Marconi said that it would not be used as part of the chain of wireless stations around the world.

"We intend to send all messages for the United States only through Belmar, which will be the longest sending station in this country," he said. "The distance from there to Carnarvon in Wales is 3,000 miles. Glace Bay station, which I am going to look at before I return to London, will be reserved for Canadian and Pacific wireless messages.

"By the new route from Carnarvon to Belmar the speed of messages will be increased from 30 to 60 words a minute, which will be a great improvement in the service for commercial transatlantic messages."

Asked about the upset in London over Marconi shares, the inventor said it had been a most regrettable business and had done a great deal of harm all around, but that he still believed his company would get the contract from the British Government.

The case against the National Electric Signaling Company comes up next Monday in the United States Circuit Court. This company controls what is known as the Fessenden system, which Mr. Marconi contends is an infringement of his patents.

Copper Stocks Decrease.

A decrease of 8,074,883 pounds in copper metal on hand on June 1, as compared with the beginning of the previous month, was announced by the Copper Producers' Association.

Stocks totalled 67,474,225 pounds, or less than two weeks' output, but 23,000,000 pounds greater than the low point—44,333,000 pounds—touched on July 1 last year.

Production during May increased 5,986,014 pounds.

Domestic deliveries in May were greater than for any month this year, and showed an increase of 2,949,484 pounds compared with April.

Program for Ohio Electric Light Convention.

The nineteenth annual convention of the Ohio Electric Light Association will be held at the Breakers Hotel, Cedar Point, O., on July 15, 16, 17 and 18.

The first session will be on Tuesday afternoon and will include the address of the president, reports of the officers and an address and demonstration of "Cooking by Unity-Load-Factor Electric Ranges," by Mathias E. Turner, of Cleveland.

Wednesday will be known as "Commercial Day," with a session in the morning. There will be papers by Thomas F. Kelley, of Dayton, on "Retention of Business of Dissatisfied Customers;" by J. E. North, of Springfield, on "New Business;" by F. C. Caldwell, of Ohio State University, on "New Applications of Electricity as an Adjunct to New Business;" by H. E. Armstrong, of East Liverpool, on "Means of Developing and Diversifying the Present Load."

On Thursday morning there will be reports from the Meter Committee and the Long-Distance Transmission Committee and an address by S. G. McMeen, of Columbus, on "The Human Equation."

At the final session on Friday morning there will be papers by James V. Oxtoby, of Detroit, on "Franchises." and by A. M. Seeger, of Toledo, on "Illumination as a Commercial Product."

Extensive arrangements for entertainment will be made as usual, including special music, baseball and waterball games, dancing, banquet and vaudeville entertainment. Bowling and card parties, a launch ride and musicales will be provided for the ladies. On Thursday evening there will be a Jovian rejuvenation.

The usual souvenir program is being printed and will be issued in advance of the convention. There will be exhibits by the manufacturers, as usual, and reservations of exhibit space should be made with the secretary, D. L. Gaskill, Greenville, O.

Electrolysis at Trenton.

The Water Department of Trenton, N. J., has been having tests made by Albert F. Ganz, professor in the Stevens Institute of Technology, in regard to the deterioration of its underground pipes from electrolysis.

The most marked tendencies of corrosion were found on North Clinton Avenue and Perry Street. Tests were conducted for continuous 24-hour periods, measurements being taken of the potential difference between the water pipes and the rails of the street-car lines.

The report of Professor Ganz states that it will be impossible to entirely eliminate electrolysis in this case, but that a sufficient number of return copper cables to conduct the current to the power house will reduce it to a minimum.

Chicago Section, Electric Vehicle Association.

At the regular meeting of the Chicago Section of the Electric Vehicle Association of America, on Tuesday, June 17, Homer E. Niesz, chairman of the Section, appointed the following Convention Committee to have charge of the general arrangements for the annual convention of the Association, which will be held in October: the officers and John F. Gilchrist, E. E. Witherby, W. L. Rudd, Uri B. Grannis, L. E. Burr, G. H. Atkin and L. E. Wagner.

The chairmen of standing committees for the ensuing year were appointed as follows:

Membership, E. E. Witherby.
Publicity, Henry Farrington.
Garaging Facilities, Ernest Lunn.
Papers, D. C. Arlington.
1914 Show, L. E. Wagner.
Disposition of Second-Hand Cars, L. E. Burr.
Traffic Regulation, W. J. McDowell.

There was considerable discussion with respect to an electric truck show in connection with the coming convention in view of the fact that the electric-truck manufacturers will not exhibit at the national automobile shows in New York or Chicago next winter. It was decided, however, that the time was too short in which to arrange for an adequate exhibit, and the probability is that there will be a mammoth electrical exposition held in Chicago in the fall of 1914, when the electric trucks and electric pleasure vehicles will make a conspicuous exhibit.

The next meeting of the Chicago Section will be held in the rooms of the Traffic Club at the Hotel La Salle on Tuesday noon, June 24, when the topic for discussion will be "Rectifiers and Rheostats." It is expected that several men prominently connected with the mechanical and engineering departments of the industry will be present to lead in the discussion.

Industrial Education Convention.

The seventh annual convention of the National Society for the Promotion of Industrial Education will be held in Grand Rapids, Mich., October 19 to 25, inclusive. Joint sessions will be held with the National Committee on Vocational Guidance and the Chamber of Commerce of the United States. The secretary of the Society is C. A. Prosser, 105 East Twenty-second Street, New York City.

Electricity in Button Manufacturing.

Uniformity of speed, resulting in improved quality of product and increased output, is but one of the several advantages of motor drive that apply specifically to button factories, yet is of sufficient importance in itself to dictate the adoption of this form of power. Detailed conditions in typical plants are discussed in this article.

No line of improvement in button-making machinery has contributed more to the securing of low cost of production and high grade of output than the adoption of the electric motor drive. In the manufacture of all kinds of buttons uniform speed is absolutely essential, particularly in the cutting and grinding departments. Here not only does the quality of the product depend upon uniform speed but the productive capacity of each machine is increased from 5 to 100 per cent due to maintenance of speed under varying conditions of load.

All machines should be run at their maximum economical speeds. It is sometimes the case in button factories, that machines are actually running too fast for first-class work, but generally the opposite is true. The inherent defect in well loaded private plants is that when there is the greatest demand for power to meet the increased factory output, the prime mover slows down somewhat. If lineshaft drive is employed, there is an additional loss of speed due to belt slippage. The machines, therefore, actually run slower at this time than when speed regulation is of less importance. The output of such a factory during busy seasons is, therefore, less than what it would be if all machines were kept up to speed.

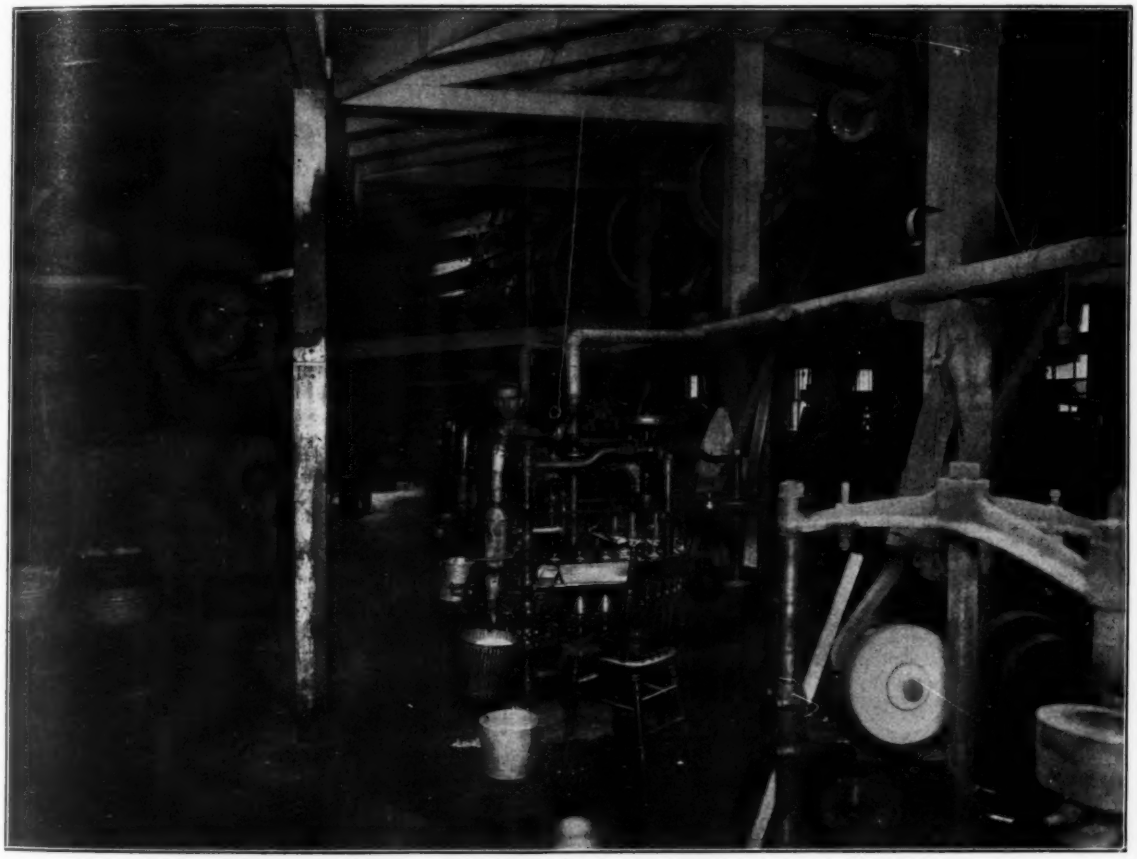


Fig. 1.—Group of Automatic Button Machines Driven by 20-Horsepower Motor.

While increased production and quality of product are obviously the most important results attained by the installation of electric drive, it is also true that direct economies are very frequently effected in power costs. Apart from the saving in energy made possible by the ability of the operator to shut down those machines not engaged in production work, the elimination of shafting, belts, pulleys, idlers, etc.,—which form an indispensable part of any mechanical system—must of necessity result in important power economies, especially if it is remembered that mechanical drives often consume from one-half to four times the energy required by the machines themselves.

A careful study of button-manufacturing processes often suggests a much better arrangement of the machinery in a plant so that a minimum amount of handling with a maximum facility for rapid work is obtained. This rearrangement of machinery, without regard to lineshafts is impossible with anything but electric drive.

In addition to the arrangement of machinery for the best possible routing of material, it should be remembered that good illumination increases the output and decreases the number of second-grade buttons. The elimination of belting and shafting improves lighting and permits of better natural ventilation as well.

Labor is such a large item in the cost of button manufacture that reliable pow-

er is of paramount importance. There is now no doubt that the modern central station is better equipped and actually does give better service than an isolated plant. The central-station company's spare engines and boilers are ready in case of trouble, and an organized body of trained operators meet quickly any emergency. To equal these measures of precaution would be prohibitive in the case of isolated plants.

The advantages of motor drive and central-station power for button factories are admirably illustrated in the plant of a Davenport, Ia., manufacturer making pearl buttons from clam shells taken from the Mississippi River. Briefly, the processes of manufacture in this plant are as follows: The shells are first taken to the sawing department where the button blanks are cut. The saws consist of small tables, with headstock and tailstock. The saws are hollow and cylindrical shaped and are mounted in the headstock. The shells are held in small tongs or pliers, held by the workmen and forced against the saws by the tailstock. The number of blanks obtained from a shell varies from 3 to 7 or 8, and the size of the blank depends upon the size of the shell, the large button blanks being cut from the large thick shells.

From the cutting department the blanks are taken to classifiers while the shells are conveyed to a crusher plant. The classifiers sort blanks into six different sizes, according to their thickness. They consist of two parallel steel rolls inclined at an angle of about 30 degrees, and made in six sections, the distance between rolls varying in each section. The blanks are fed through a hopper to the classifier.

After being sorted the blanks are taken either to the automatic button machines, if these are equipped for grinding, or to the carborundum grinders. These machines simply comprise double emery wheels revolving over a traveling belt upon which button blanks are placed by hand. A view of this grinder is shown in Fig. 2.

Four of the automatic finishing machines in this plant are designed to take blanks directly from the classifiers. These machines have a rotating face plate with slight circular depressions around the periphery. Blanks are placed in these depressions and carried under an emery wheel where one side is ground flat. The ground blanks fall onto chucks and in falling are turned over. The chucks are on an endless chain, revolving continuously. While held in these chucks a circular depression is drilled in the center of the button and four holes cut. The drills used in cutting these holes are automatically sharpened after each cut is made. The other automatic machines in this plant do no grinding, simply cutting the desired design in the center of the button and drilling two or four holes as desired. Each machine is connected by a small pipe to a central blower which exhausts the dust.

From the automatic machines the buttons are taken to tumbling barrels for washing and then to the polishing machines, which are inclined barrels revolving the buttons in an acid solution.

As previously mentioned, the shells, after being utilized to their fullest extent for blanks, are taken to the crusher plant where they are ground and made into poultry food. The pulverized shell is also used in the manufacture of fertilizer.

The motor installation in this plant, although perhaps not representing the most approved practice, has operated satisfactorily and has resulted in an increase in production of approximately 20 per cent over the mechanical system previously used. Two squirrel-cage induction motors are used in the cutting department, both of five-horsepower size running at 1,700 revolutions per minute. One is belted to shafting driving 26 button-blank saws, and the other operates 27 saws. Fig. 3 shows one of the motors belted to two rows of saws. The shafting is beneath the tables, which is an excellent arrangement in this case.

All of the additional machines in the

(Continued on page 1315)

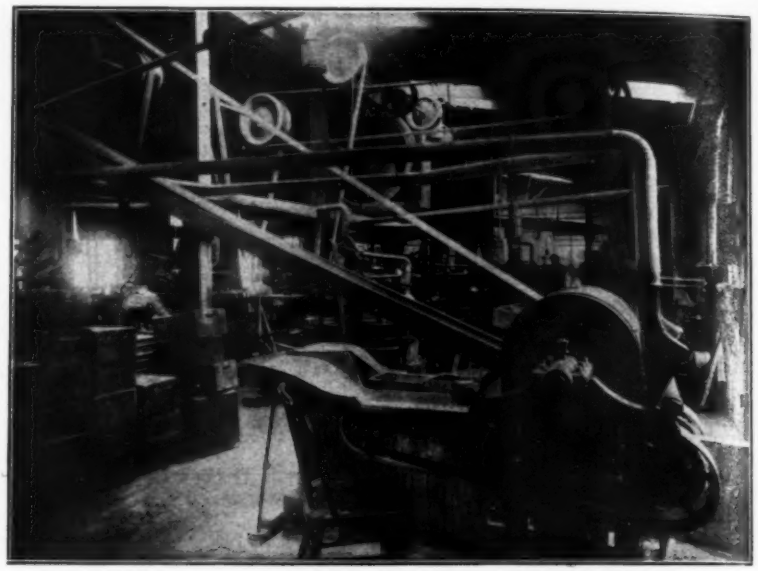


Fig. 2.—Button-Blank Grinders.

Fig. 3.—Group of Button Saws Driven by 5-Horsepower Motor.

Button Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Button factory located in Amsterdam, N. Y., manufacturing pearl buttons from fresh-water clam shells. Blanks are obtained from the company's cutting plants located along the Mississippi River. The average daily output of the plant is 23,000 gross of buttons per 10 hours. 173 automatic button machines are installed, but 81 of these are still operated from steam-engine plant.

Total connected horsepower, 330. Total number of motors installed, 4. Average kilowatt-hours per month, 74,000. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	71,490	May	76,320	September	73,990
February	75,660	June	73,390	October	72,560
March	62,440	July	71,380	November	81,690
April	73,160	August	78,520	December	78,980

Load-factor, 43 per cent; operating-time load-factor, 85 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horsepower.	Speed R. P. M.	Application.
1	85	800	Belted to a line shaft driving 11 double grinders, wheels 18 inches in diameter, 4-inch face; five double grinders, 12-inches by three-inch wheels; 39 classifiers; 26 tumbling barrels; one polishing machine; and two drying machines.
1	85	800	Belted to countershaft driving two 70-inch exhaust fans operating at 1,000 revolutions per minute.
1	85	800	Belted to line shafting driving 48 Barry Manufacturing Company automatic button machines; 17 shakers, for drying buttons; 47 polishing machines; and one 1,500-pound freight elevator.
1	75	950	Belted to line shafting driving 44 Barry Manufacturing Company automatic button machines; and one Buffalo No. 10 exhaust fan.

Button plant manufacturing pearl buttons from an imported shell. The average weekly output is 200 gross of buttons. There are four men employed working 10 hours per day.

One three-horsepower squirrel-cage induction motor is installed. Average kilowatt-hour consumption per month, 285. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	356	May	276	September	485
February	234	June	274	October	360
March	349	July	236	November	325
April	166	August	123	December	242

Load-factor, 20 per cent; operating-time load-factor, 36.5 per cent.

The approximate electrical energy consumption per 100 gross of buttons is 30 kilowatt-hours.

MOTOR INSTALLATION.

The following is a record of the motor installation. The supply source is three-phase, 60 cycles, 220 volts:

No.	Horsepower.	Speed R. P. M.	Application.
1	3	1,700	Belted to a 26-foot, six-hanger shaft driving one tumbling barrel for polishing buttons; one grading roll for classifying buttons according to size; one drying drum; three cutting lathes; two carborundum-wheel button grinders; one hexagonal shaker; and one Sturtevant No. 0 blower.

Button plant manufacturing ivory buttons from vegetable ivory. A few styles of metal shells for cloth-covered buttons are also made. The average output of ivory buttons is 1,000 gross per day of 10 hours.

Total connected horsepower, 71.5. Total number of motors installed, 9. Average kilowatt-hours per month, 3,057. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,130	May	2,850	September	4,540
February	2,360	June	3,060	October	2,810
March	2,570.	July	2,800	November	4,530
April	2,570	August	3,430	December	3,030

Load-factor, 7.8 per cent; operating-time load-factor, 17 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors, except one, are of the squirrel-cage induction type.

No.	Horsepower.	Speed R. P. M.	Application.
1	5	1,200	Belted to a line shaft driving 12 polishing drums.
1	5	1,200	Belted to a short line shaft driving small blowers for sand blast.
1	7.5	1,200	Belted to a line shaft driving three automatic drilling machines; and five hand drilling machines.
1	3	1,700	Belted direct to one polishing machine.
1	3	1,200	Belted to a line shaft driving three drying drums.
1	3	1,200	Belted to a line shaft driving four gas-heated button presses; and one small lathe.
1	5	1,200	Belted direct to one shucking drum for removing shells of ivory nuts.
1	30	950	Belted to a line shaft driving eight button saws, and 16 button turning lathes.
1	10	1,120	Slip-ring motor driving elevator.

Button Manufacturing Data—Sheet No. 2.

Button factory located in Davenport, Ia., manufacturing a line of inexpensive pearl buttons from fresh-water shells. A crushing plant is operated in connection with the factory in which the shells from the cutting department are crushed and made into poultry food. Fertilizing companies also purchase some of this ground shell. The output of the plant is 2,000 gross of buttons per 10-hour day. There are 70 men and 40 girls employed.

Total connected horsepower, 75. Total number of motors installed, 4. Average kilowatt-hours per month, 7,597.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	6,905	May	8,071	September	5,480
February	8,512	June	7,485	October	8,412
March	9,947	July	4,480	November	8,148
April	8,204	August	7,345	December	8,175

Load-factor, 18 per cent; operating-time load-factor, 39 per cent.

The approximate electrical energy consumption per 100 gross of buttons manufactured is 20 kilowatt-hours.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,700	Belted to a four-foot, two-hanger line shaft which drives 27 button-blank saws through 80 feet of countershafting (18 hangers).
1	5	1,700	Belted to a four-foot, two-hanger line shaft which drives 26 button-blank saws, through 75 feet of countershafting (18 hangers)
1	50	850	Belted to an 80-foot, 12-hanger line shaft and 85 feet of countershafting (15 hangers), driving two tumbling barrels, two feet long, 18 inches diameter; six sieves, two feet long, one foot wide; four Barry automatic finishing machines; 11 Barry automatic machines for drilling only; one Barry automatic machine for cutting grooves; one miniature drill press; one emery wheel, 12 inches by 1.5 inches; two classifiers for sorting blanks according to thickness; one B. F. Sturtevant 30-inch exhaust fan, 2,965 revolutions per minute, exhausting from machine room; two Barry 18-inch double emery wheels, 1,250 revolutions per minute; seven tumbling barrels, two feet long, 1.5 feet in diameter; and two inclined-barrel polishers, two feet long, 1.5 feet diameter. Barrels inclined at angle of 45 degrees.
1	15	1,700	Belted to a 20-foot, two-hanger line shaft and 10 feet of countershafting (four hangers), driving one Williams shell crusher, 30-inch diameter, 2,000 revolutions per minute; one 16-inch exhaust fan; one 4-inch by 4-inch bucket elevator, 30-foot lift; one metal revolving screen; and one horizontal chain conveyor, 20 feet long.

Button factory manufacturing an inexpensive line of pearl buttons from fresh-water clam shells. The cutting department operates a night shift, while other departments operate 10 hours per day. There are 70 employees, mostly girls. The average output of the plant is 2,500 gross per day. All buttons are sold in bulk.

Total connected horsepower, 175.5. Total number of motors installed, 8. Average kilowatt-hours per month, 12,074.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	12,830	May	11,760	September	10,730
February	13,770	June	14,049	October	11,230
March	12,370	July	12,580	November	11,430
April	13,070	August	10,760	December	10,310

Load-factor, 13 per cent; operating-time load-factor (exclusive of cutting department), 27 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors installed in this plant are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	7.5	1,200	Belted to a line shaft driving 28 button-blank saws.
1	5	1,700	Belted to four feet of line shaft and 60 feet of countershafting driving 20 button-blank saws.
1	5	1,700	Belted to six feet of line shafting and 50 feet of countershafting driving 24 button-blank saws.
1	5	1,200	Belted to a line shaft driving four double emery wheels, 18-inch diameter, for grinding rough side of blanks.
1	3	1,200	Belted to a six-foot line shaft driving five polishing drums, two feet long, 18 inches in diameter.
1	85	850	Belted to 65 Barry Manufacturing Company's automatic button machines; 39 classifiers; and two drying machines.
1	50	900	Belted direct to a Sturtevant exhaust fan for automatic machines.
1	15	1,200	Belted to a line shaft driving one shell crusher; one bucket elevator; and one 15-inch exhaust fan. This crusher plant operates only when there is an accumulation of shells, the ground refuse being used in making poultry food.

button-plant proper are driven by a 50-horsepower squirrel-cage induction motor running at 850 revolutions per minute. The machines driven by this motor comprise nine tumbling barrels, six sieves, 12 Barry automatic button machines, four

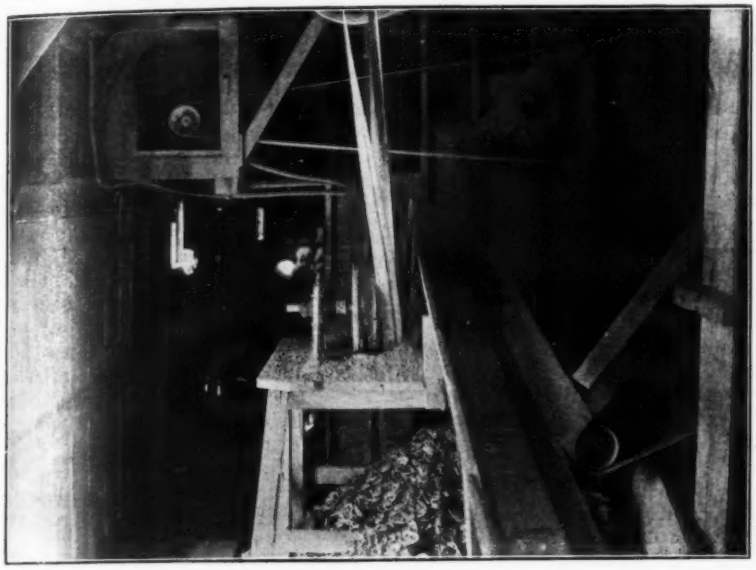


Fig. 4.—Motor Driving Shell Crusher.

grinding and drilling and eight drilling only, two barrel polishers, two double emery wheels, and one 30-inch fan.

This installation could undoubtedly have been improved by driving the auto-

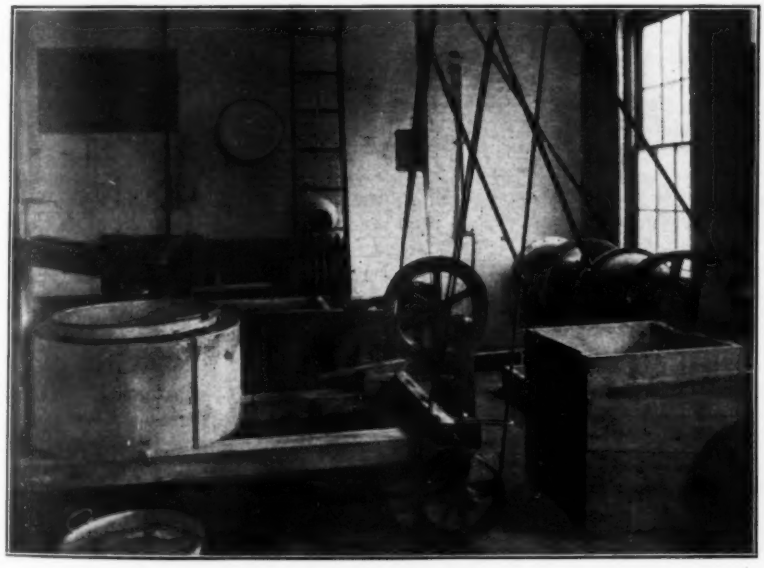


Fig. 5.—Polishing Drums.

matic machines and blower with one motor and using one or two other motors for the tumbling barrels, etc. In general one-half horsepower is required for each automatic machine and as in most plants they operate continuously, group driving is the usual method used.

In the crushing department one 15-horsepower squirrel-cage induction motor running at 1,700 revolutions per minute is installed. This motor drives, through shafting, one Williams shell crusher, 30 inches in diameter and operating at 2,000 revolutions per minute, also one bucket conveyor for elevating crushed material to top of building, one 16-inch exhaust fan, one horizontal conveyor, and one revolving screen. The latter screens the crushed shells into three grades. Fig. 4 shows the motor in the crushing department.

The average output of this plant is 2,000 gross of buttons per day. The average kilowatt-hour consumption per month, 7,597 and the load-factor, 18 per cent.

The foregoing plant manufactures pearl buttons exclusively and is typical of a number of similar plants located along the Mississippi River. Some few plants manufacturing pearl buttons from fresh-water shells are located in the East but usually these have cutting plants in the Middle West which cut the shell and ship the blanks. There are also a great many isolated cutting plants that sell the blank buttons to other companies to use when the delivery of shells becomes scarce as frequently happens during the course of the year.

Next in importance to pearl-button manufacturing are ivory button plants. These plants use what is known as vegetable ivory, a nut about the size of a small egg, found in South America and Africa. The nuts as they are received by the button factories must be dried before using. This is done either naturally by placing the nuts in the sun, or artificially in steam driers. In drying, the meats of the nuts are hardened and turn a pearly white. The nuts are then placed in what are known as shucking drums which are revolving barrels equipped with iron paddles. In these drums the hard thin shell which incloses the meat is removed.

The kernels are then cut into thin slabs by means of small disk saws revolving at a speed of 8,800 revolutions per minute. The slabs are then placed in turning lathes, which turn the buttons according to the size and design desired. From these the buttons are taken to the drills where holes are drilled. Polishing the buttons in revolving drums is the next operation and finally they are dyed and finished in a number of different ways.

A typical plant manufacturing vegetable ivory buttons is that of a Chicago company, having a daily output of 1,000 gross. The machines are arranged in small groups and the operation of the plant has been very successful since adopting central-station service. One shucking drum, driven by a five-horsepower squirrel-cage induction motor is sufficient to supply the needs of this plant. There are eight disk cutting saws and 16 turning lathes driven from a 30-horsepower motor, running at 850 revolutions per minute and a five-horsepower motor is used to drive a battery of 12 polishing drums. Drilling is accomplished by eight machines, three automatic and five of the hand variety, all driven by a 7.5 horsepower motor.

In the finishing department a three-horsepower motor is installed for driving four gas-heat presses.

Complete data on this and other plants are given in the accompanying data sheets.

Commercial Practice
Management, Rates, New Business

APPRAISAL AND MANAGEMENT OF SOLICITORS.

By W. H. Gregg.

Every commercial manager of a public-utility company can immediately list his salesmen according to their relative values to the company. Almost invariably the list is headed with the name of the salesman whose annual sales total the highest. The names following are arranged in the order of highest annual sales. Common practice seems to indicate that this method of rating is right and just. The dollar sign appears to be the universal measurement so why not use it to measure salesmen. A few of us are ready to say it is not a fair or a satisfactory method to the company or salesman.

When public-utility companies first established sales departments, they secured recruits from the sales forces of machinery companies and these salesmen brought with them the method of rating under discussion. In the majority of cases a machinery salesman's relations with a purchaser end with the sale, so it is right that his value to the company should be measured with the dollar sign. On the other hand, when a public-utility salesman closes a sale, that is just the beginning of his, and his company's, relations with the purchaser. The value of the sale to the company is unknown at this time and never will be known until the purchaser has stopped using the commodity. This is not always at the expiration of the first contract. In view of the impossibility of determining the value of such a sale, it has become necessary to adopt a method which is supposed to give an average value. Most companies have adopted an estimate of the first years' revenue from the contract. This method is of course unjust to salesmen bringing in contracts having terms varying from one to ten years, with the probability of an ever increasing load and income. On the other hand, the contract may be cancelled within a few months, or competition may make it necessary to reduce the rate, or conditions might arise to reduce the rate, or conditions might arise to reduce the consumption, so that the estimate of the first years' revenue would be too great a credit. All of which goes to show that the value of a salesman's work cannot be indicated by the dollar sign. Still, this factor must be used in some way, because it stands for that in which the companies **are most interested,** dollars. Is there another factor in the salesman's work that is more important? No! But there is one nearly as important and several others that cannot be overlooked.

The number of sales by a salesman is a very important factor. A salesman signing one contract during the month worth $1,200 annually in revenue has not been as valuable to his company that month as the salesman who signed twelve contracts each worth $100 annually. The latter salesman has made 12 friends for his company, any one of whom may before long develop into the $1,200 class; he has had his ambition quickened by 12 victories; he has probably improved the station diversity-factor; he has put 12 consumers out of the reach of the competing companies; he has been busy. The other minor factors contributing to a salesman's worth are: his reputation with the public; his prominence in public activities; his ability to secure contracts from which no misunderstandings arise; his willingness to co-operate; and his loyalty. The dollar sign cannot measure these qualities.

It is wrong to criticize a system without offering a remedy. The following method of appraising salesmen has been used successfully by a central station in a city of about 150,000 inhabitants.

A new electric company had entered the field to compete for business. The amount of business secured during the first year was satisfactory, but later sales began to fall off at a distressing rate. A new commercial manager was installed. No funds were available for extension of lines, therefore, he was expected to build up the income from business accessible to the distributing system as it existed. There was plenty of station capacity available. He found the soliciting force to be a promising one from outward appearances. Each solicitor had a district of the city in which to work. It developed that no especial plan had been used in outlining these districts. It also developed that the solicitors had been working their districts without intelligent direction from the office. A still stranger fact developed in the discovery that the salesman's value was based solely upon the number of contracts he secured each month. No attention was paid to the character of the sales or the expense of connection. The efficiency of the salesman, i. e. the ratio of the number of contracts he secured to the number available, was something unknown. This system of managing and valuing salesmen, just as the one where their value is based on annual sales, had caused discontent and disloyalty among the men and, of course, resulted in poor sales records.

Salesmen A, B and C were receiving the same salaries. Their salaries were larger than those usually paid to salesmen. A had the record for the greatest number of contracts secured and his annual sales totaled highest too. He was discontented, because his salary was not larger than that of B or C. He never stopped to think that he was overpaid. He merely figured that he was worth more money than B or C. B acknowledged A's records, but pointed out the fact that A's district was the best in the city. He claimed his annual sales far exceeded C's, yet C drew the same salary. He and A should be "raised" he thought. C in his turn was discontented with conditions. He had more contracts to his credit than B, but his district was such a poor one for large contracts that he felt he was not treated fairly. Salesmen D, E and F who were in the next lower class had similar tales of woe.

Had the new commercial manager not been a salesman in the past, he would have been distressed, but he had experienced the same woes when a salesman and knew there was a foundation for most of the discontentment, except that over the size of the salaries. The time had come to devise a new system, something original.

A few days' inspection of the territory covered by the distributing system was sufficient to give the commercial manager an idea of how the city could be divided into sections for the salesmen. These sections were then outlined in such a manner that each one would include business and

people of a certain class, and were made of an area which would give each salesman practically the same number of available prospects. The salesmen were then selected to look after the section for which each appeared to be best suited. One was placed in the section containing the foreign element, another among the high-class merchants and office buildings, another in the section of residences and small business houses, etc. Each man was to confine his efforts to his own section. If he left it to solicit in another, the credit for the contract went to the salesman whose district was invaded. Esprit de corps was depended upon to make each salesman "tip off" prospects to his fellow workers. The salesmen were informed that the outlines of the districts were only tentative and would be altered from time to time.

They were also given to understand that their efforts were to be spent in securing as much business as possible and as soon as possible but their work would not be appraised solely upon the number of contracts secured. It would be necessary to use judgment. The company wanted profitable contracts and all of those available, but the salesmen were not to spend days of their time soliciting a contract estimated to be worth $24 annually in preference to devoting time to securing one worth $400 annually. They must not overlook nor refuse the small business, but must only give it the time it deserved.

A card record of available business was kept in the office and a glance at the number of these cards, as compared with the number of contracts secured, showed how well each man was attending to his district.

Having the men in the field at work, it became necessary to devise some method of appraising their work and determining whether their districts were properly designed. Since the value of their work was to be based upon the income of their contracts and the number of their contracts, mere tabulation or curves seemed to be of no use. Bearing in mind the discontent of the salesmen mentioned before, it seemed most important that the salesmen should be made to run a neck and neck race. Then there would be no opportunity to complain about being underpaid, no excuse for boasting and a good excuse for keeping busy and striving. This seemed possible to accomplish if every man could be given an even chance. The accompanying set of curves were devised to accomplish the results designed and did so with great success.

The curves in Fig. 1, were plotted with ordinates based on "estimated annual income" from contracts. Each salesman was represented by a colored line. The curves in Fig. 2 had ordinates based upon "number of contracts secured." The curves were made accumulative and on the first of each month were brought up to date and posted in plain view.

What was the result? The salesmen watched and studied. Each man knew his work was on exhibit. He did not feel he was being mistrusted or spied upon as is often the feeling when a daily card is handed in showing how many calls were made, who was interviewed, what "he" said and what you said and when you were to call again, etc., etc. Only results were wanted by the manager. How these results were obtained, how many calls were necessary, who was talked to, etc., were not wanted. If too many or too few calls were made the salesman's record would suffer. If underhanded work was resorted to, it would come to the surface later.

It developed that C had previously been striving to make a record on the number of contracts secured. He had a district of fair-sized business houses favorably inclined to competition. Note how his style of work changed to the betterment of the company's interest. He stopped devoting $25 worth of time to secure $12 worth of business. His "No. of contracts" curve decreased and his "estimated annual income" curve increased.

C's curve in Fig. 2 showed that his district was not properly outlined, so it was changed to include some larger places of business formerly in B's district.

D had a good district, but he was not industrious nor efficient. His curve lagged behind the others in both cases. He was not paid as much as A, B and C, but was retained as long as his work showed improvement and he kept pace with E and F. When both curves started to slope to the horizontal, his services were dispensed with. E and F fought for position. Their districts were altered and their work continued to improve until they finally attained the class and salaries of A, B and C.

A's curves in both sets soon took the lead, but were not so much in advance as to produce boasting or dissatisfaction. His district as first outlined proved to be right and did not need changing.

B had a district of big business. He spent too much time on the big jobs and neglected the smaller ones, so his curve in Fig. 1 was high and in Fig. 2 low. He was content to secure a couple of large contracts and rest the remainder of the month. His district was narrowed and changed to include some small business houses and he was warned about inactivity. That brought his curve in Fig. 2 to its proper place.

Before long each man was satisfied with his district and found himself in a neck-to-neck race to maintain his position. The company's income and connected load doubled in one year's time, without extensions of main lines, the load-factor improved and a steady flow of new business resulted. The improvement of the diversity-factor, and the improvement of rates

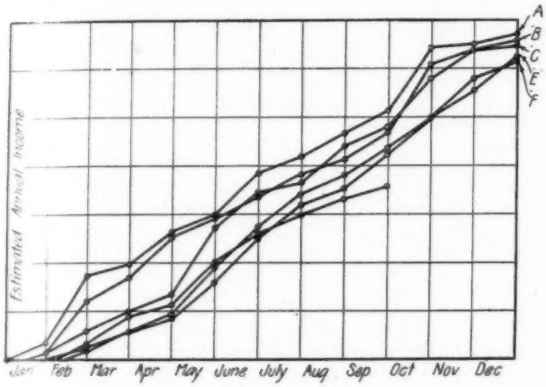


Fig. 1.—Salesmen's Income Curve.

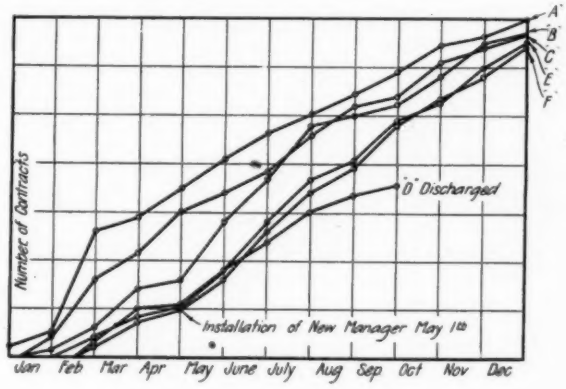


Fig. 2.—Salesmen's Contract Curve.

were next followed up and form another chapter.

In conclusion it must be stated that the abstract qualities of the salesmen were not overlooked even though they could not be plotted in curves. The commercial manager applied the "personal contact" method to the appraisal of these. Daily morning talks with the salesmen brought the manager into intimate touch with all prospects and contracts and he was able to make mental notes on how A took time to collect a bad debt, how B spent some of his time making himself and his company prominent in civic organizations, how C pulled off a little political stunt of value, etc. He noted how few disputes arose from consumers in A's district and how there was an everlasting amount of them coming up in C's district, due to careless or slippery work. The concrete values can be given these qualities, but as they are of minor importance they can be borne in mind in studying the curves in Figs. 1 and 2.

Central-Station Progress in Pittsburgh.

Speaking before a recent meeting of the Allegheny County Lighting Company Section of the N. E. L. A., W. A. Donkin, general contracting agent of the company, interestingly outlined the developments during the past 10 years. The contracting department then consisted of the general contracting agent, one clerk, and stenographer, and one solicitor. On December 31, 1912, the staff of solicitors in the department totaled 43 men. Increase in number of contracts in force was equally great having grown from 4,574 in 1900 to 41,177 at the close of last year. An increase in connected power load from 7,000 horsepower in 1903 to 50,000 horsepower last year is the record of the power department. In analyzing the rapid growth of the power business, Mr. Donkin emphasized the importance and value of quick action in emergency cases and a continuing interest in the quality of service rendered after a customer has been secured.

Illustrating his point of quick action he cited the case of a manufacturer employing about 300 men, in whose plant the crank-shaft of a 200-horsepower engine was twisted off at 7:35 Saturday morning. The company was called up and informed that if it could furnish and install motors and connect service so that the plant could resume operations at seven o'clock Monday morning following, a contract for electric service would be given. The wiring department was ordered on the job immediately and by working continuously until six o'clock Monday morning completed their work. The district superintendent, E. N. Patterson built the required pole-line extension and had the wires strung by nine o'clock Sunday night. Men from the laboratory under William Riley worked all day Sunday making necessary transformer changes. At seven o'clock Monday morning 126 horsepower in motors were operating the plant and the business is now returning the company a revenue of more than $750 a month.

In the three years that the sign department has been established a total of 533 signs have been placed on the lines, yielding a revenue for that period of $70,186.08. This is aside from business controlled by sign companies who purchase current from the company, and whose business has undoubtedly been greatly stimulated by the activity of the sign department.

Five electric stores are operated by the company, located in Pittsburgh, Allegheny, Wilkinsburg, Bellevue and Verona. The largest of these is the Highland Building store under the efficient management of E. F. Harrison, and which in 1912 reported total sales of small appliances of $34,089.

The following figures indicate increases in contracts written and load connected from 1905 to 1912.

Year	No. Contracts Written	Gain in No. Contracts	Increase Load in Kilowatts
1905	5,939	1,304	5,356
1906	8,173	2,265	8,128
1907	8,292	2,378	8,887
1908	6,243	439	2,232
1909	8,308	2,647	8,618
1910	10,281	3,589	10,837
1911	11,545	3,706	9,819
1912	14,057	4,213	10,370
Total..	72,838	20,541	64,247

The company is at present operating in 48 municipalities in Allegheny County, as against but three in 1903.

Campaign for Washing Machines.

A novel advertising campaign is being conducted by the Electric Shop of Chicago. The manager is desirous of pushing washing machines and devotes a great deal of attention to this end.

The campaign consists of newspaper advertising, circular matter and personal solicitation. In the newspaper space he is advertising an $85 electric washing machine to be given away for the best article describing the saving made possible by the use of such a machine. Any one can compete.

Blanks will be furnished to all desiring to compete to aid them in preparing lists of savings. These blanks show spaces for estimating the wages, food and carfare to servants and washwomen, labor, fuel, soap, wear and tear on materials washed, tearing out buttons, laundry damage, laundry loss, cleaner's bills, time, space, damage from steam in the room, long boiling and health.

This newspaper campaign will be followed up by circulars sent to a list of 25,000 names. More of these circulars will be kept in the Electric Shop. It was not expected that direct sales from this advertising would be great, but that the returns were to be received primarily from the general publicity. However, the returns from the newspaper advertising so for have been very satisfactory, and it is evident that the campaign will be financially successful.

The newspaper advertising campaign is believed to be the best method of impressing upon the general public the enormous saving made possible by the use of an electric washing machine. The average person who is not using such a machine believes them to be a great convenience, but has probably not realized the extent of the cash saving.

Home-Made Week at La Crosse, Wisconsin.

Home Made Week was celebrated at La Crosse, Wis., from May 25, to 31. The merchants gave up their show windows to the manufacturers, nearly 100 of whom took advantage of the opportunity to have their goods better known locally.

The most prominent display was that of the La Crosse Gas & Electric Company, which was largely due to the illumination. The company obtained a corner building for its display and placed 15 Humphrey three-mantle gas arcs round the roof, which was very favorably commented upon by the press and the public.

The window display of the company consisted of an electric dining room and a gas kitchen. The exhibit included Clark Jewell ranges, Humphrey Geysers, Vulcan irons, General Electric appliances, Sturtevant vacuum cleaners, and Equalite glassware.

Guessing Contest Stimulates Business.

A variation of the usual form of window display is that which has been arranged by the Ohio Valley Electric Company, of Ashland, Ky., which has combined a guessing contest with an exhibit emphasizing the usefulness of the Mazda lamp as compared with the ordinary incandescent. A pile of carbon lamps has been placed in a corner of the window with a sign, "Knocked Out," above them. Nearby a Mazda lamp is burning. Visitors to the company's office are invited to submit guesses of the discarded lamps in the pile. Those coming closest to the correct number will receive prizes in the form of electric appliances, including a toaster, percolator, iron, etc.

Electrical Construction

ELECTRICAL EQUIPMENT OF THE PACIFIC MILLS NEW PRINT WORKS DEPARTMENT.

A Description of the Generating Plant, Motor Installation and Alternating-Current Distributing System.

By Theodore A. Bergen.[1]

The construction of the Pacific Mills New Print Works Department, at South Lawrence, Mass., was begun in 1910. This plant is under the same management as the cotton and worsted departments at Lawrence, and the Cocheco Manufacturing Company, at Dover, N. H., which is known as the Pacific Mills Cocheco Department, and is to serve as a finishing plant for these departments. The plant is built on a rectangular lot, 1,500 feet long and 550 feet wide, bordering the Merrimac River. The buildings cover an area of approximately 20 acres. Fig. 1 is a bird's eye view of the plant, and Fig. 2 is a plat showing the general arrangement of buildings which are now completed. The plant comprises the following buildings and departments: office building, printing building, filter building, power house, store house, finishing building and central building, which building, covering an area of nearly six acres, contains the departments for singeing, chemicals, bleaching, dyeing, drying, etc. The plant when finished will assemble in one place all the print works machinery formerly in use at the old Print Works at Lawrence, the Cocheco Print Works at Dover, and the Hamilton Print Works at Lowell.

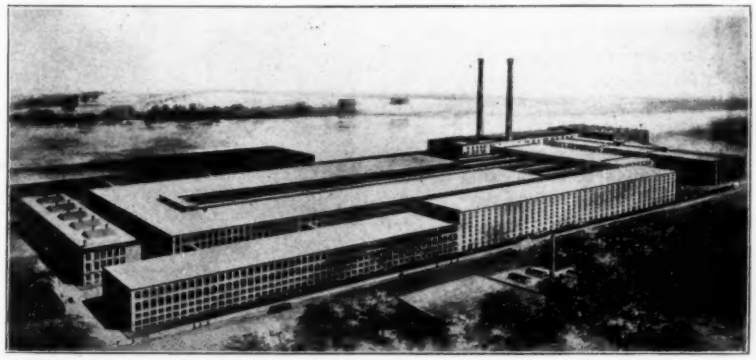


Fig. 1.—Bird's-eye View of Plant.

The capital stock is $12,000,000.

Following is a statement which gives the present equipment, etc., of the Pacific Mills for which the New Print Works will serve as a finishing department:

312,160 cotton spindles; 87,600 worsted spindles; 340 cotton cards; 85 worsted cards; 10,468 looms; 80 worsted combs; 48 printing machines; 150 acres of floor space; 9,000 employees.

Generating Equipment.

When the power requirements of the plant were first taken up for study, this being about three years ago, it was estimated that the electrical load for the entire plant would amount to about 4,000 horsepower. Approximately 60 per cent of this was calculated to be required for driving constant-speed machinery, while about 40 per cent, or 1,600 horsepower,

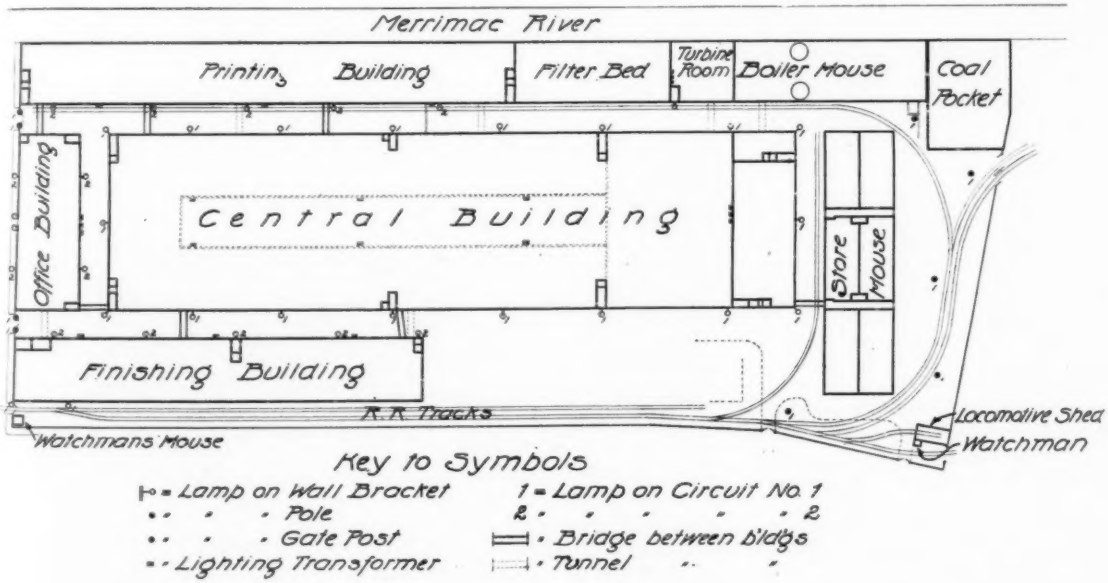


Fig. 2.—Ground Plan of Buildings.

[1] Electrical Engineer with Lockwood, Greene & Company.

must be provided for driving machinery for which adjustable speed is the prime requirement.

Naturally the induction type of motor was selected for all constant-speed work, the only question being that as to voltage. The different voltages which could seriously be considered were 550 and 2,200. In other plants of the company the 550-volt induction motor is used, and, naturally, this was a strong argument in favor of installing the same type in this plant, as such a step would make it possible to interchange motors between the different plants. Another point in favor of the 550-volt unit was the fact that, with this rating, motors of any desired size can be obtained, while with the 2,200 volt rating the smallest motor developed so far, having reasonable economy, is of the 20-horsepower size. Owing to the great extension of the plant, however, transmission losses and first cost of installing transmission circuits in conduits as desired, would be considerably greater for a 550-volt system than for one for 2,200 volts. It was found that in this case the saving in feeders and switchboard equipment, and the more economical distribution to be obtained by adopting a 2,200-volt system, would be so considerable that it would more than outweigh any advantages of a 550-volt system. For this reason it was decided that all induction motors should be wound for 2,200 volts. Therefore, it was decided that all motors driving constant-speed machinery and having a capacity of 25 horsepower or over, should be of this type.

For all adjustable-speed machinery it was necessary to provide direct-current motors, since the speed adjustment required in some cases was of the ratio of one to five and alternating-current motors have not yet been developed for such service. It was further decided to use direct-current motors in all places where the capacity of the motor would be less than 25 horsepower regardless of whether the requirements called for constant-speed or adjustable-speed duty. This was because of the fact already mentioned, that no 2,200-volt alternating-current motors of small sizes can be had, and it was done in order to avoid the introduction of still another voltage system of motors, with necessary feeders, and generator or transformer equipment.

In this way about 300 horsepower in non-variable speed motors was added to the direct current system, so that the total direct-current motor load now amounted to about 1,900 horsepower.

For all direct-current motors a voltage rating of 230 was decided upon, this voltage being best suited for all requirements.

To decide upon the equipment to be installed for generating the energy required for the alternating-current motors was a comparatively easy matter when the voltage had been determined; all that was left to do was to decide as to size, number and type of generating units. A 750-kilowatt, 3-phase, 60-cycle turbo-alternator, removed from another station belonging to the company, was already on hand, and naturally the unit or units for furnishing the additional energy required were to be so selected that all of them could be operated in parallel.

As to the direct-current source of supply, however, this was not such an easy matter to decide upon. As can readily be seen, a number of different methods for obtaining this energy were possible. As many as five different schemes were suggested and carefully studied before final decision was reached. These five different schemes were as follows: (1) To generate direct-current energy at 250 volts in the turbine room and distribute from this point throughout the plant; (2) to generate alternating-current at 2,300 volts with turbo-generator, and transform this energy at this point to direct current of 250 volts pressure by means of transformers and rotary converters, distribution system to be the same as that mentioned in (1); (3) same as (2) except that instead of transformers and rotary converters motor-generators were considered; (4) same as (2) except that transformers and converters instead of being installed in the turbine room were to be installed near the load centers for the direct-current motors—there

Fig. 3.—Corner of Turbine Room.

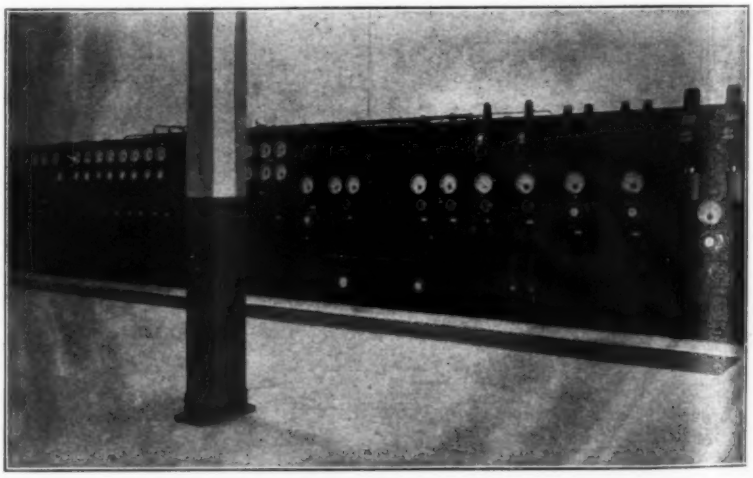


Fig. 4.—Front View of Main Switchboard.

would be two such locations, one in the printing building and one in the central building; and (5) same as (4) except that motor-generators were to be substituted for transformers and converters.

All these schemes were given thorough study, the advantages and disadvantages of each being considered and the total efficiency for different load conditions being estimated.

The following table gives the electrical efficiencies of the different systems (not including motors), under full-load conditions:

TABLE.

Scheme	Efficiency
1	89 per cent
2	81.5 " "
3	74 " "
4	83.5 " "
5	76 " "

As is well known, motor-generators cannot anything like compete in efficiency with transformers and rotary converters. This is shown very clearly in the above table. On account of this, schemes (3) and (5) were eliminated from consideration.

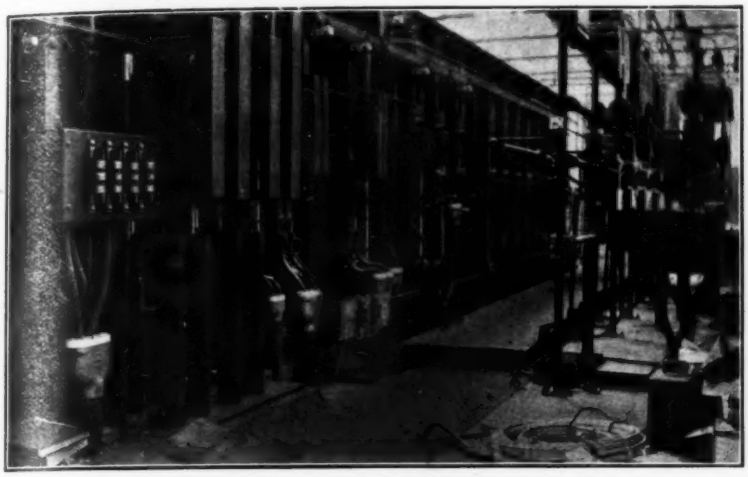


Fig. 5.—Rear View of Main Switchboard.

In comparing schemes (2) and (4), which are identical except for the location of transformers and converters, it was found that scheme (4) would cost a few thousand dollars more than the other, but at the same time that it had two per cent greater efficiency, which, at an output of 1,000 kilowatts and a producing cost of $30 per kilowatt, meant $600 per annum. By adopting scheme (2), however, a better load-factor could be obtained at all times, which would probably more than balance the saving obtained by scheme (4) on account of its greater efficiency. It must also be borne in mind that with scheme (4) an extra attendant would be needed at least part of the day. Another objection to scheme (4) was the difficulty in starting up converters installed as contemplated in the scheme. No direct current being available, they would have to be started from the alternating-current side, which, of course, is a great disadvantage, owing to the tremendous amount of lagging current taken in starting.

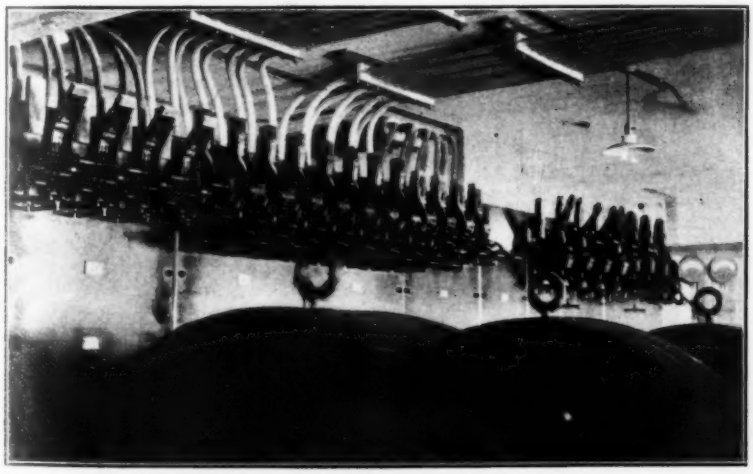


Fig. 6.—Connections to Upper Portion of Balancer Switchboard.

It was mentioned above that by adopting scheme (2) a better load-factor could be obtained than would be possible with scheme (4). The truth of this is obvious. A still better economy could be obtained, moreover, by using 250-volt excitation for the alternating-current generators, as this would make it possible at times to use some of the exciters for carrying part of the direct-current motor load. Some study of this proposition was made, but the scheme was finally abandoned on account of the impossibility of securing standard alternators designed for this excitation in this country.

The problem was thus reduced to choosing between schemes (1) and (2). Scheme (1) had a great many advantages. It had the greatest efficiency. This higher efficiency, figuring on the same basis as above, would mean a saving of between $2,000 and $3,000 yearly.

The installation would occupy a minimum of space. Fewer machines would be needed, and, therefore, the chances of a breakdown would be reduced. The control would be the simplest.

In considering this scheme, however, there were one or two features which, even if they could not be called disadvantages, were of such serious and vital importance that special attention had to be given them. As is well known, the most troublesome thing about the operation of a direct-current generator is the commutation. Where the generator is driven by a belt or is direct-connected to an engine, this matter is not so serious, for in both cases most suitable speed conditions are obtainable. But not so when the prime mover is a steam turbine. If the generator be direct-connected to such a turbine it must necessarily revolve at the same speed. This speed being very high, a special design of commutator and brushes is necessitated, and all such designs appeared to be in a more or less experimental stage. Even in Europe, where this problem has probably received more study than elsewhere, it is generally admitted that it is yet far from solved. Many sad experiences with machines of this type in recent years in this country, prove that neither have they reached a state of perfection here. All this applies particularly to large capacity generators of comparatively low voltage, say 250 volts or less, where great amounts of current must be handled.

As an indirect remedy for this objectionable feature in a turbine-driven dynamo, there appeared on the market a few years ago direct-current turbine unit in which the generator was connected to the turbine through a system of reduction gears. It is evident that with such an arrangement both turbine and dynamo can be designed for greatest efficiency at the most desirable speed, independent of one another, as the reduction gear can be developed for any ratio of speed trans-

formation desired. This method for generating direct current of great amperage by the use of a steam turbine as prime mover is certainly a very good one, provided the gears can be made durable and efficient. The method is not a new one; it has been used by manufacturers of high-speed turbines for about 20 years as a means of utilizing such turbines where, on account of their high speed, they could not be used without the introduction of gears. But in all such instances only a relatively small amount of power had to be taken care of. It is but recently that gears for heavy loads have been developed. However, the experience with the smaller gears has been entirely satisfactory; in many cases their durability and efficiency have been so remarkable that it has become a matter of record for mechanical devices of this kind. It is but natural, therefore, that when heavy gears of similar construction were developed, great expectations were placed on them.

As has been stated, this installation was planned about three years ago. Since then many direct-current turbines with reduction gears have been developed to large capacities. The largest unit of this kind ever built, to the writer's knowledge, has a capacity of 37,500 kilowatts.

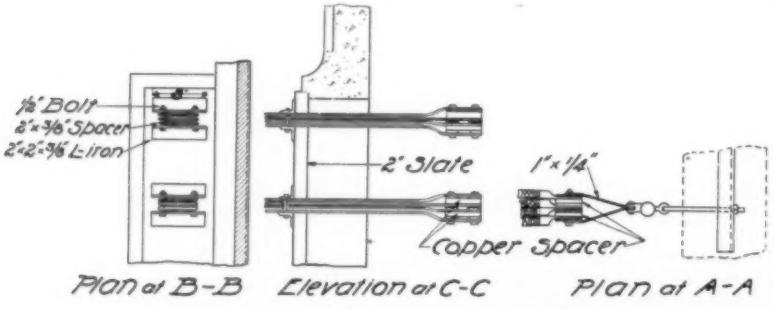


Fig. 7.—Details of Method of Anchoring Cables.

After a careful study of all these matters, and after visits to numerous plants where units of either type were installed, it was finally decided that scheme (1) should be adopted. Two units, each consisting of an 1,100-horsepower DeLaval multistage steam turbine of 3,600 revolutions per minute, connected through a system of open-hearth steel gears of the 45-degree helical type, with involute teeth, to a 600-kilowatt, 250-volt, 600-revolutions-per-minute generator, were ordered and are now in operation at the plant. The generators have an overload capacity of 25 per cent for continuous service and of 50 per cent for a period of two hours.

The equipment of the station at present consists of the following machines:

One 750-kilowatt, three-phase Allis-Chalmers turbo-alternator; 2300 volts, 60 cycles, 1,800 revolutions per minute, the turbine being of the reaction type.

One 1,250-kilowatt, three-phase General Electric turbo-alternator; 2,300 volts, 60 cycles, 3,600 revolutions per minute, the turbine being of the reaction type.

One turbogenerating unit consisting of a 130-horsepower De Laval single-stage steam turbine direct-connected to the following units: one 35-kilowatt, 250-volt, direct-current generator; one 50-kilowatt, 2,300-volt alternating-current generator; one 2-kilowatt 60-volt exciter.

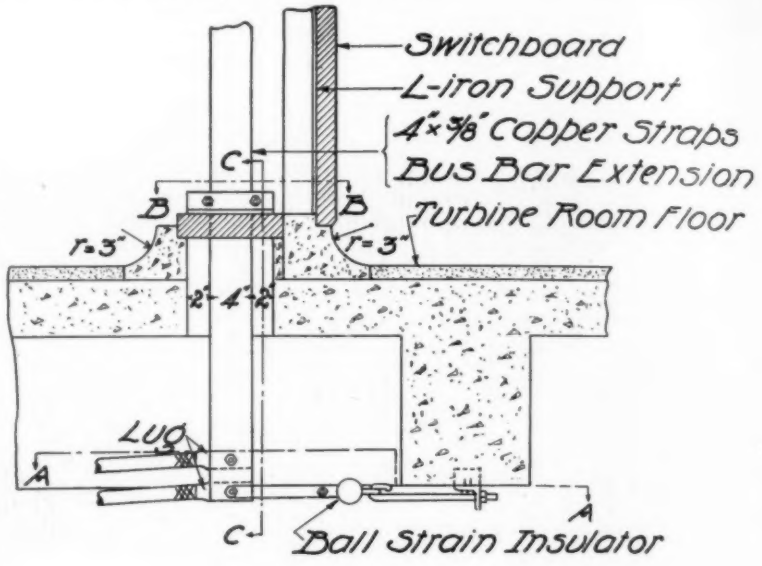


Fig. 8.—Busbar Extension and Method of Attaching Cables.

Two 600-kilowatt direct-current generators (already mentioned).

One 35-kilowatt 125-volt turbo-exciter, speed 1,500 revolutions per minute, connected through reaction gears to a De Laval turbine having a speed of 15,000 revolutions per minute.

One 50-kilowatt motor-driven exciter.

Maximum capacity in direct-current power, 1,850 kilowatts;; normal capacity, 1,235 kilowatts.

Alternating-current capacity, at 80 per cent power-factor: maximum, 2,050 kilowatts; normal, 1,640 kilowatts.

Total normal capacity of the station, 2,875 kilowatts.

The double generator turbo-unit was installed to furnish a small amount of power required in case of overtime work in certain sections; for instance, in the shipping department or repair shop. The alternating-current generator is sufficient to drive a small motor, and also to furnish the necessary power for lights. The

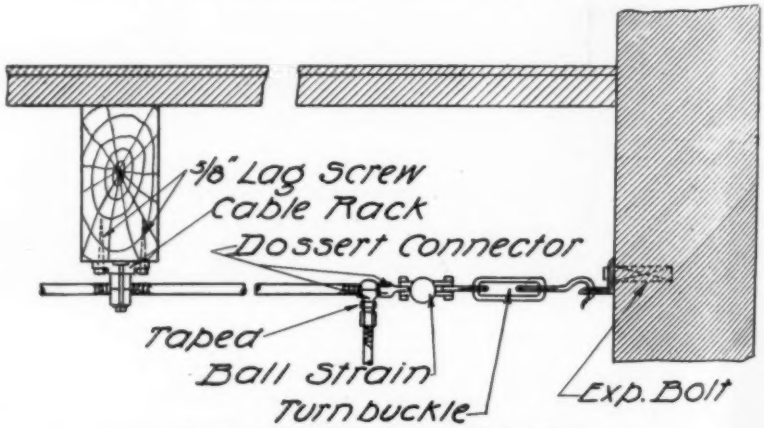


Fig. 9.—Further Details of Cable Installation.

purpose of the direct-current generator is particularly to furnish power for elevators on such occasions as when the big generators are shut down. All elevators are driven electrically by direct-current motors.

Fig. 3 shows part of the interior of the turbine room. In the foreground a cement base, 10 feet from the wall. Behind the board is a slot in the concrete floor to allow for passage of conduit carrying the wires for generator and feeder circuits. All connections between switchboard and alternating-current apparatus are made with lead-covered cables in iron conduits. Connections between board and

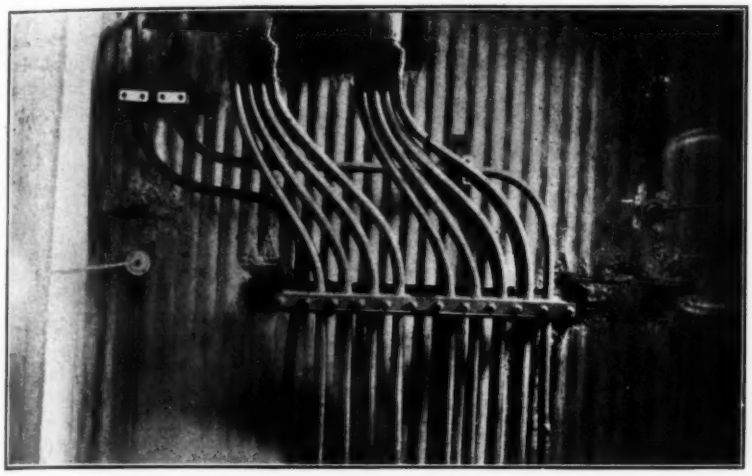


Fig. 10.—Direct-Current Mains Connecting to Busbar Extensions.

will be seen the exciters and behind them the direct-current turbogenerators.

Switchboards and Station Wiring.

Figs. 4 and 5 are front and rear views, respectively, of the main switchboard. This board is installed along the west wall of the turbine room, as shown partially in Fig. 3, and controls all the apparatus in this room and all the main feeders for the plant. Fig. 6 is a view of the so-called Balancer Switchboard, a

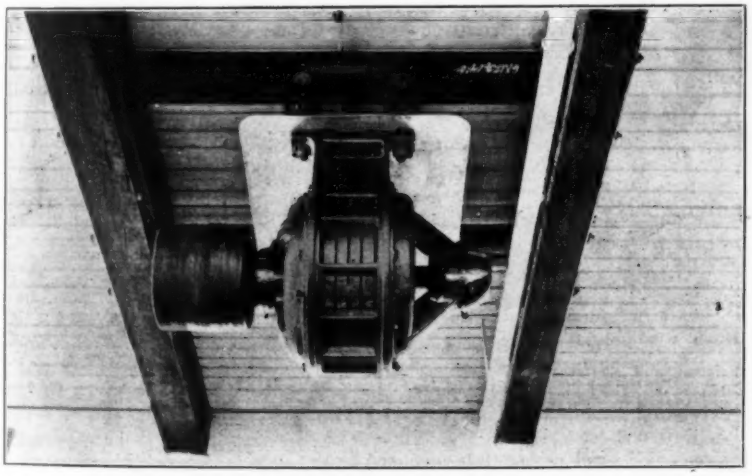


Fig. 11.—Motor Suspended from Ceiling.

board for controlling the multivoltage system. This board will be described further in connection with this system.

The main switchboard consists of 21 panels, the left half of which is for alternating current and the rest for direct-current apparatus. The board is set on direct-current generators are slow-burning wires run open on racks on the ceiling of the basement. They are not brought through the floor back of the switchboard; instead, the busbars are extended to a point below the level of the basement ceiling where they connect to the generator leads. The outgoing direct-current main to the balancer switchboard (which will be described later) is connected as is shown in Fig. 10. This is a view of the ceiling of the turbine room basement showing the mains connecting to busbar extensions. Figs. 7, 8 and 9 show the construction in detail, also the design of the switchboard base. The equipment of the different feeder panels will be described later in connection with the different wiring systems.

The leads from the direct-current generators are connected to the busses through disconnecting switches and protected by circuit-breakers. Each generator panel is equipped with ammeter, voltmeter and watt-hour meter.

The leads from the turbo-alternators are connected to the board through non-automatic oil circuit-breakers. Each panel is provided with one ammeter and a power-factor indicator, an indicating wattmeter and watt-hour meter; also with potential receptacles for common voltmeter on swinging bracket at the end of the board.

Power Distribution.

Alternating Current Feeders and Motor Wiring.—All 2,300-volt wiring is done

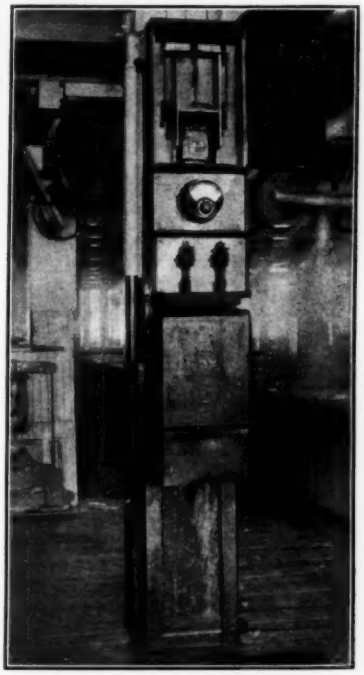


Fig. 12.—Starting Equipment for 100-Horsepower, 2,300-Volt, Three-Phase Motor.

with lead-covered cable installed in iron conduit. In all cases three-conductor, varnished-cambric insulated cables are used. The main feeders run from the switchboard in the turbine room on the ceiling of the basement, part through the filter bed and part through a tunnel into the bleachery, to their various points of destination about the plant. (See Fig. 2.) Each circuit is protected by an automatic oil circuit-breaker with polyphase overload relay installed on the main switchboard. Two circuits are connected to each panel. Each circuit is equipped with power-factor indicator, indicating wattmeter and watt-hour meter. The feeders are installed so that generally each department is supplied by an independent feeder (sometimes several feeders are required for one department),

and therefore the power consumed by each department is registered by the watt-hour meters on the switchboard, and the accounts charged accordingly.

As far as practicable, the different circuits have been installed uniformly. A standard feeder consists of a No. 00 B. & S. gauge, triple conductor, lead-covered cable, run in 2.5-inch conduit. The load on any such circuit in no case exceeds 550 horsepower.

Very few elbows or bends were allowed in the conduit runs; instead, a great number of junction boxes and pull boxes were used. All joints and splices are made in approved junction boxes. In many cases, especially at single branch-off points, special split boxes were used to advantage. These boxes, made of cast iron, are so designed that after the splice has been made and properly taped up they can be clamped to the conduit in such a manner that they entirely cover up the joint and at the same time afford proper rigidity to the conduit system. After they have been thus fastened in place they can be filled with compound, as in the case of an ordinary box.

Most motors for driving productive machinery are hung from the ceiling. Fig. 11 shows a motor in place. As will be seen from this picture, the motor is bolted to a pair of double I-beams, these I-beams in turn being bolted to another pair which span between the floor timbers and are riveted to a couple of channel irons on the side of the timbers. This is a very flexible arrangement as it allows for considerable adjustment in any direction. It also allows sprinkler piping and electric wiring to run past it, as a liberal clearance could be allowed between the cross beams and the ceiling.

A shield of galvanized iron is installed over the motor to protect it from water which might leak through from the floor above.

Each motor is provided with a starting compensator, equipped with overload relays and no-voltage release, ammeter and disconnecting switch. Fig. 12 shows this equipment installed on a concrete column.

Generally the feeder is run on the ceiling of the same story where the motors and starters are located, in which case a junction box is introduced above the starting apparatus, from which junction box a branch is taken off to the apparatus in question. At other times the feeder is run on the ceiling of the story below, in which case the branch is brought through the floor and up to apparatus located above. This is the case shown in Fig. 12.

The disconnecting switch is a 100-ampere, 2,500-volt, quick-break knife-switch, designed to be operated with a rod. It is installed in a cabinet specially designed for this installation and in which also are installed potential transformer and fuses for the no-voltage coil. This is shown in the upper portion of Fig. 12. On account of the motors being scattered over a considerable area, it was found more economical to install a separate potential transformer for each compensator than to run a system of low-tension wiring from a common transformer. The line wires are connected to the upper terminals of the disconnecting switch; from the lower terminals the leads are brought through the ammeter and overload relays to the compensator below. The relays are inclosed in a special case, or cover, attached to the top of the compensator, and the ammeter is mounted on the front of this cover. The wires from the disconnecting switch above enter the relay cover through bushings at the top and pass at the back of this cover, connecting to meter and relays, down to the compensator. The leads from the compensator to the motor run back in the same way; the disconnecting switch in the cabinet is mounted on a marble base, which is set out from the back of the cabinet so as to allow for passage of these wires. From the top of this cabinet they are run in conduit to the motor frame, inside of which the connections are made. The low-tension wires for the release coil are run from the fuses through the relay cover to the compensator, the case of which is drilled to allow for these wires being connected to the coil outside. In this way all connections are entirely inclosed and the chances for accidents to employees or operators are very remote.

(To be continued)

Changes in New York Code.

Commissioner Henry S. Thompson, of the Department of Water Supply, Gas & Electricity, announces that the following changes in the Electrical Code of the City of New York went into effect June 1.

Paragraph *a* of Rule 39A, which previously specified that wiring in garages must be either in approved conduit or in approved armored cable, was amended to read: "Approved metal conduit or approved armored cable must be employed, except in offices and show rooms, where approved metal molding may be used."

The third paragraph of Rule 30*a*, which was previously the same as the third paragraph of Rule 30*a* in the National Electrical Code, is charged to read: "Where insulating joints are required fixture canopies of metal must be thoroughly and permanently insulated from metal walls or ceilings on metal lathing, and from outlet boxes.

Rule 23, first paragraph, is amended to permit the installation of 16 sockets or receptacles on one final cutout. (See National Electrical Code, Rule 23.)

Rule 23*d* is further amended to permit 32 sockets or receptacles on one cutout where the sockets are keyless and are wired with conductors equal in size and insulation to No. 14 rubber-covered wire, and the wiring is carried direct into the socket. Special permission is required for the installation of so large a number of sockets, however, and the location must be such as to render the attachment of flexible cord to the wires unlikely.

Rule 38*d* is changed to conform to the change noted in the immediately preceding paragraph, as is also Rule 38*e*.

Rule 72 is changed so that sockets must be rated for installation purposes at not less than 40 watts each, instead of at not less than 50 watts as heretofore. This rating does not apply of course, to sign and outline lighting.

Among the Contractors.

The firm name of Wadewitz & Schenkenberg, at 219 Wisconsin Street, Racine, Wis., has recently been changed to the Wisconsin Electrical Equipment Company. As well as doing a general electrical contracting business, this firm is making a specialty of industrial power plant work and farm lighting. The company has in connection with its business a completely equipped machine and repair shop.

The Electrical Construction Company, of Racine, Wis., has just been awarded the contract for wiring the new First National Bank Building, inclusive of the fixtures. A high-class job of fixture work recently installed by the Company was that done on the New Elk's Building in Racine, where some very handsome effects in indirect and semi-indirect lighting were obtained.

NePage, McKenny & Company, electrical engineers and contractors, of Seattle and Portland, Ore., Vancouver and Victoria, B. C., and Spokane, Wash., have been awarded the electrical work on the 10-story Title and Trust Company's Building No. 4, between Oak and Stark Streets, Portland, Ore. MacNaughton & Raymond were the architects. Contract amounts to approximately $1,500. They have also been awarded the contract for installing a complete cluster lighting system in the city of Cashmore, Wash., which includes 120 posts complete with lamps, globes, wire, conduits, etc.; also additional apparatus in the power house is contracted for. The amount of the contract is $6,000. NePage, McKenny & Company have also been awarded the electrical contract on the National Drug Company's Building, Vancouver, B. C.; approximate amount of contract $2,000. H. S. Griffiths is the architect on this building.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Block for Testing Fuses.

Having a quantity of fuses to test not long ago, I decided it would pay to make something that I could use again. I took a wooden block about two by ten by seven-eighths inches in cross-section and screwed two receptacles, such as we use in open wiring, to it. These are marked No. 1 and No. 2 in Fig. 1. I then took a socket and, removing the shell and cap, cut the edge so that a lamp or fuse would slide in from the side instead of having to be screwed in. This I screwed to the board. It is marked No. 3 in the figure. Using a 50-watt lamp in No. 1 gives me a steady light to work by if it is dark or I am working in a basement. Using a red 10-watt lamp in No. 2 and a fuse in No. 3 shows when the fuse is good, for the red lamp lights up then. The fuses are slid in from the side and may be tested as fast as they can be handled. To test lamps, I use a fuse in No. 2 and slide the lamps in No. 3 as fast as desired. Hooks may be put on the terminal wires and these may be hooked over a knife switch or the contact points of a cutout block.

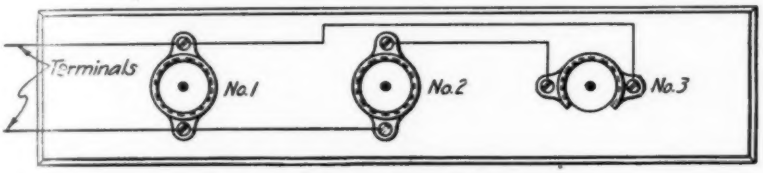


Fig. 1.—Plan of Test Block.

F. H. Northrup.

Short-Stem Fixtures Easy to Hang.

In a kink in the issue of May 24 I noticed a plan for putting up short-stem fixtures. The writer's method is undoubtedly a good one, but I believe my way of handling such fixtures is much quicker and just as good.

I first screw the crowfoot on the fixture stem, counting the number of turns it takes to make it up. I then remove the crowfoot and fasten it to the wall (or ceiling, as the case may be), and then make the connections and solder and tape in the usual way. Next I carefully turn the fixture as many turns to the left as it took turns to put the crowfoot on the stem. I finally turn it to the right, taking care that the threads catch at once, and when the fixture is made up the wires are not twisted and the insulation is in good condition.

W. A. Hines.

Light For Generator Rooms.

Not long ago I was doing night duty in a power plant where there were two engines and generators running. All of a sudden an accident occurred which cut off the power and left the entire plant in total darkness. And nothing could be done until a fireman brought a burning brand in from the furnace room.

This experience impressed upon my mind very forcefully the importance of having ready, temporary light within reach; so I immediately purchased several electric flash lights, which I located in convenient places about the generator room. I took some sheet brass and made a pair of clasps for each. The light can be easily pressed into these holders and quickly removed when needed. I cut some sheet brass into strips one-inch wide and 15 inches long and made the clasps as illustrated in Fig. 3. After mounting them on a small board five inches wide and twelve inches long they are ready to fasten to the wall for service.

W. A. Hines.

Another Way to Hang Short-Stem Fixtures.

In the issue of May 24 I noticed a wiring kink by William H. Best, in regard to putting up short-stem fixtures.

While I always screw up the crowfoot first and then screw the fixture into it, I have not experienced trouble with twisting up the wires, as I proceed in the following way.

I turn the fixture backward about half as many turns as it will take to screw it into the crowfoot lightly, and, of course, when I start to screw it in I am untwisting the wires for the first half of the operation and twisting them up only during the last half of it, which is not enough to injure the insulation.

J. Warren Ramsey.

Getting the Solder Into the Lugs.

Not long ago I had to connect up a panel box set in the wall, into which a five-inch conduit entered at the bottom. This pipe contained five 1,000,000-circular-mil lead-sheathed cables which had to be connected to the busbars, and these bars were so close to the bottom of the cabinet that it was impossible to bend the cables over to sweat the lugs on them. I got around the difficulty by drilling two quarter-inch holes in the top of each lug, as shown in Fig. 2, for the solder to enter through. Having slipped a lug into place on the end of a cable, and then having taped asbestos around the bottom to keep the molten solder from running out, I applied the heat and melted the solder in through the holes provided for the purpose.

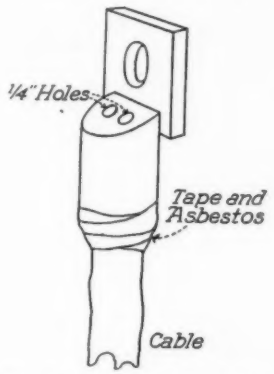


Fig. 2.—Lug Drilled for Solder.

George C. Norris.

Replacing Fixture Studs.

I recently had a number of fixture studs to replace in outlet boxes in a ceiling of cement construction, where the bolts that were used originally were either knocked off or corroded so badly as to loosen the stud entirely. As it happened, the outlet boxes in use were not tapped in the back or machine screws. Therefore the stud could not be fastened on in that way; so I took some blank metal covers, drilled them for bolts to hold the stud on the lid, and holes large enough to bring the wires through; then I put the cover with the stud bolted to it on in the usual way, except that I turned it with the inside out, to place the stud in the box as far as possible.

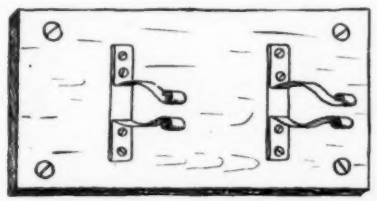


Fig 3.—Flashlight Rack.

J. F. Painter.

Among the Supply Men

Meeting of Southern Jobbers.

A very interesting meeting of a number of southern jobbers was held at Memphis, Tenn., on Friday and Saturday, June 13 and 14. Among those present were Oscar Turner, president of the Turner Electrical Supply Company, Birmingham, Ala.; Thos. A. Burke, sales manager of the Western Electric Company, Atlanta, Ga.; J. J. Smith, general manager of the Baltimore Electrical Supply Company, Incorporated, Atlanta, Ga.; I. L. Faucett, manager electrical department, James Supply Company, Chattanooga, Tenn.; M. B. Wheeler, general manager, Tel-Electric Company, Houston, Tex.; C. Robert Churchill, president, Electric Appliance Company, New Orleans, La.; M. F. Sterett, Electric Appliance Company, New Orleans, La.; Percy Sterns, Interstate Electric Company, New Orleans, La.; E. C. Jumonville, secretary, Interstate Electric Company, New Orleans, La.; Harvey R. Worthington, H. R. Worthington & Company, Jacksonville, Fla.; William R. Herstein, president, Electric Supply Company, Memphis, Tenn., and H. C. Adams, Woodward, Wight & Company, Limited, New Orleans, La.

The visiting jobbers were W. W. Low, president Electric Appliance Company, Chicago; N. G. Harvey, general manager Illinois Electric Company, Chicago; W. A. Brown, treasurer M. B. Austin & Company, Chicago; F. A. Pierce, manager Manhattan Electrical Supply Company, Chicago; George E. Cullinan, manager Western Electric Company, St. Louis, Mo.; and Wm. H. Nolker, Commercial Electric Supply Company, St. Louis, Mo.

Others in attendance were Bertram M. Downs, Hemingray Glass Company, Covington, Ky.; A. L. Millard, Westinghouse Electric & Manufacturing Company, Chicago; C. R. Hunt, General Electric Company, Chicago, and A. A. Gray, managing editor ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago. Mr. Hunt acted as an efficient master of transportation for the visiting contingent.

Sessions were held morning and afternoon at the Hotel Gayoso, with Mr. Turner presiding. There was a spirited discussion of matters respecting the relation of the jobber with electrical manufacturers, electrical contractors and with each other. A great deal of very useful information was brought out and arrangements were made for the collection of considerable data for subsequent use in determining the cost of doing business and the relation of profit to gross sales. Mr. Low took a leading part in the discussion and was enthusiastically applauded for his sound logic and the back-stiffening effect of his opinion.

In addition to the serious discussion, Mr. Herstein provided a delightful entertainment program which, in the words of Mr. Downs, demonstrated the "height of hospitality." On Friday evening an Italian dinner was served at Nuvolina's. Following the supper on Friday evening a vaudeville show at East End Park was attended. On Saturday luncheon was served at the Chickasaw Club. The Saturday afternoon program included a boat trip on the Mississippi River and a baseball game between teams representing Montgomery and Memphis. Through the courtesy of L. G. Van Ness, general manager of the Merchant's Power Company, the golfers in the party were tendered the privilege of the Memphis Country Club, a feature that was indulged in and enjoyed to the limit. It is expected that the next meeting will be held in October at Chattanooga, Tenn., when reports will be heard from several special committees.

Turner Brothers Secure Southern Wesco Supply Company.

The Southern-Wesco Supply Company no longer exists. At a meeting last week in the private offices of President Oscar C. Turner, the Turner Electric Supply Company was formally organized as the successors to the Southern-Wesco Company.

The officers of the new company are: Oscar C. Turner, president; Jos. E. Fitzsimmons, vice-president; William M. Bowles, secretary, and John D. Turner, treasurer. The new company has purchased all the stock of the old company and takes over all its stock.

The deal by which the Turner brothers secured all the stock in the Southern-Wesco Company has been pending for several weeks and Oscar Turner has been North and East on several business trips in that connection. The negotiations were started with the death of Roger V. Scudder, vice-president of the old company, some few weeks ago in St. Louis. Mr. Scudder represented the stock owned in the Southern-Wesco by the Wesco Supply Company and this is what the Turner brothers took over.

This makes this big business now strictly a Birmingham concern. While the company at present acts as jobber and wholesaler in electrical and automobile supplies and accessories, Mr. Turner has stated that in the course of time, as the business expands, it is their intention to erect in Birmingham a large electrical-apparatus manufacturing plant.

Mr. Turner went to Birmingham four years ago from Ohio after touring the South for a location for an electrical house. The big Wesco firm then had a branch at Birmingham, so the Turners consolidated with the Wesco people, whose main offices are in St. Louis, this partnership lasting until the death of Mr. Scudder of the Wesco Company.

Since Mr. Turner went to Birmingham four years ago, the business of the company has grown by leaps and bounds. At that time three men were employed in the office, while at this time there are 31 traveling representatives of the company covering the states of North and South Carolina, Tennessee, Georgia, Florida, Mississippi and Alabama. They do a wholesale business outside of Birmingham and a retail business in the city. The new company has been admitted to membership in the National Electrical Supply Jobbers' Association.

The directors of the new company as elected at a recent stockholders' meeting are Oscar Turner, William M. Bowles, T. Ulmer Nenon, L. A. Daniel and John D. Turner.

The Hudson Electric Supply Company, New York, announces that it has just opened a branch store at Madison Avenue and Fifty-ninth Street.

L. S. Hunt, general sales manager of the Commercial Electrical Supply Company, St. Louis, has just returned from a six weeks' trip through Texas, Oklahoma, Arkansas, Mississippi, Louisiana and Alabama, where he has been

attending state convention; and looking over general business conditions. The company is enjoying a very healthy business from these states, and the outlook for summer business is very flattering. The company has been distributing its attractive souvenir paper weight at these conventions, thereby contributing very much to its own popularity.

William J. Courtney has opened a wholesale electrical supply store under the name of the Bronx Electrical Supply Company at Melrose Avenue and One Hundred Fifty-first Street, New York City. The company is agent for the Bryan-Marsh Madza lamp.

Telephone Pioneers to Meet at Chicago.

The third annual meeting of the Telephone Pioneers of America, to be held at Chicago, Ill., on October 16 and 17, will be addressed by N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company; M. J. Carney, of the central group of companies at Chicago; and Thomas B. Doolittle, retired, of Branford, Conn. B. E. Sunny, president of the Chicago Telephone Company, is expected to make the welcoming address.

The Plan and Scope Committee, in charge of the entertainment features, consists of B. E. Sunny, A. S. Hibbard, and Frank E. Ketcham.

Electrification in Chile.

A new committee has been appointed to study the proposition of the electrification of the Government railway between Valparaiso and Santiago, Chile, with instructions to prepare plans and specifications preparatory to asking for bids. The proposition is gaining favor and it seems probable that something definite will be done before the end of 1913.

The use of electricity as a motive power in the factories of Switzerland has increased greatly in recent years, the establishments now employing electrical power being 86 per cent of the total.

Public Service Commissions

CALIFORNIA.

The Western Electric Company has applied to the Railroad Commission for authority to sell its plant at Portola, Plumas County, to the Pacific Telephone & Telegraph Company.

A decision was rendered granting the application of the Southern Sierra Power Company for an order authorizing it to proceed to the completion of its work in Riverside County.

A supplemental decision was rendered giving authority to the Pacific Gas & Electric Company to transfer certain electric properties to the West Sacramento Electric Company.

A decision was rendered upon complaint of the Quincy Chamber of Commerce against the Western Union Telegraph Company, recommending the establishment of joint telephone and telegraph service between Marston and Quincy.

MASSACHUSETTS.

Despite the veto of Governor Foss, the Legislature of Massachusetts has enacted the Washburn railroad bill, which provides for the creation of a public-utilities commission with mandatory power over railroads and all other public-service corporations except light and power companies, reference to which was made in issue of May 24. The governor's objection to the measure arose from sections which permitted railroads financial privileges which he held should be considered as a separate proposition, apart from the proposition for a commission with mandatory powers, which he favors. The three present members of the Railroad Commission become members of the new commission, and two members are to be added.

NEW YORK.

The Public Service Commission for the Second District has appointed Frank Mott, of Jamestown, as secretary. Mr. Mott is a practicing lawyer and served at one time as deputy attorney-general.

The Commission entered an order on June 12 requiring further reductions in telephone toll rates between points in New York City. These will go into effect on July 1, and have been accepted by the New York Telephone Company. Toll rates for subscribers are reduced to five cents between the main portions of New York City and the city territory on Long Island, excepting some of the outlying points, to which the rate will be ten cents. The rate between zones one and three, comprising the lower portion of Manhattan Island and the Upper Bronx, is reduced to five cents. A five-cent rate is also provided between all Long Island points in the city of New York.

OHIO.

The Public Service Commission has authorized the Columbus Railway, Power & Light Company to issue common capital stock of the par value of $1,353,930; $500,000 of this is to be used as working capital; $853,930 is to be delivered to the Columbus Railway & Light Company in payment of indebtedness and securities of the latter company. The Columbus Railway & Light Company has made extensions and improvements of the properties of the Columbus Railway Company, the Columbus Edison Company, the Columbus Light, Heat & Power Company and the Columbus Railway, Power & Light Company to the amount of $534,630. $283,000 is to be exchanged for four-per-cent bonds of the Columbus Railway Company now in the possession of the Columbus Railway & Light Company. $36,300 is to be exchanged for the same amount of six-per-cent bonds of the Columbus Light, Heat & Power Company now in the possession of the Columbus Railway & Light Company. All of the above bonds are then to be cancelled and destroyed.

INTERSTATE COMMERCE COMMISSION.

The Supreme Court of the United States handed down a decision on June 9 in the case involving the street-car fares on the interstate railway between Omaha, Neb., and Council Bluffs, Iowa. This decision interprets the act establishing the Commission as not including street railways in the jurisdiction of the Commission.

The Commisson had ruled that it had authority over such lines and had reduced the fare over the Missouri River bridge. This decision was enjoined by the Commerce Court, which is now confirmed by the Supreme Court. A distinct difference is thus established between street railways and interurban railways. The fact that a street railway crosses a state line or traverses more than a single municipality does not make it an interurban road.

MOTOR DRIVE FOR MACHINE TOOLS.

By F. E. Hanchette.

Motor drive for machine tools has come to be recognized as the most efficient, flexible and economical form of power obtainable. Individual motors for the greater proportion of machine tools, and small group drive, have done much to better the general conditions in many factories, increasing the output and at the same time reducing the maintenance cost, eliminating not only the dangers attendant on the many rapidly moving belts and pulleys, but the enormous friction losses in the many bearings and slipping belts.

The removal of line and countershafting and belting means also better ventilation, better light and consequently better results in efficiency of both machines and operators. Economy of floor space is another very important factor to be considered, as with most machines it is possible to mount the motor in such a manner, either on or near the machine, as to take up practically no additional space, and allowing an arrangement of machines to conserve floor space that would be an impossibility with belt drive where the line shafting determines the position of the machine irrespective of light, accessibility or floor space.

It is said that the friction losses in ordinary belt-driven shop equipment average about 75 watts per horsepower for each hanger, and while this may seem to be excessive it is not at all improbable, taking into consideration the fact that hangers must be placed at frequent intervals on a line shaft and in many buildings become much displaced in alinement owing to the settling of floors from varying load strains placed on them and the side strain on the hangers from the countershafts, all of which naturally increase the friction losses.

With belt drive the speed of a machine must necessarily remain practically constant except in the case of lathes or other machines where gearing and cone pulleys are utilized to effect changes, while with motor drive a wide range of speed, suited to varying conditions, is quickly and easily obtained; this feature alone adds to the sum total of the efficiency of the machine and widens its scope of work, saves time in transferring and setting up work, and results in a general saving of time, power and cost.

Speed range in connection with many machine tools is all-important, as the machine is often subjected to rough and ill usage at the hands of the operative, which causes abnormal strains upon the controlling apparatus: this must be so contructed as to be able to withstand the severe conditions which are imposed on it through inexperienced or careless manipulation and yet be reliable of operation, easily accessible and of simple construction.

The necessity of reliable automatic starting and speed-controlling apparatus to meet the requirements of the present-day equipment has brought out some highly efficient types of starting and regulating controllers, automatic and manually operated reversing controllers, float switches, pneumatic-electric and mechanical-electrical devices suited to practically any conditions under which a motor can be used for power, and while the cost of automatic starting apparatus prevents its installation in some cases, usually it will be found that it would have been, in the end, really cheaper and much more satisfactory.

In selecting a motor for driving machine tools it is of great importance that the conditions affecting the machine it will drive are thoroughly understood and allowance must be made for abnormal conditions which may at times be imposed upon it. In the case of a machine which operates at very nearly the same load under all conditions a shunt motor may be used, but if the load varies at different periods, is light at one part of the operation and heavier at others a compound-wound motor is required. Take, for instance, a planer; during the forward motion of the bed of the machine the cut taken by the tool requires a heavy output of power, which suddenly changes to only sufficient to return the bed of the machine to its first position and start it back on another cut.

This means throwing a heavy load on the motor suddenly and also as suddenly releasing it; two moments of rest as the end of the travel is reached, which places the motor under widely varying conditions, all within the space of a few seconds. Unless a motor, under such conditions, is constructed to meet the strains imposed, trouble may be looked for in the way of excessive sparking at the brushes, heating and perhaps a burnout.

A compound-wound motor, placed on the top of the planer head and belted down to the drive at the sides, gives a very satisfactory result, gearing the motor not being practical owing to the strain at the moments of reversal of the machine bed, while the belt allows a flexibility by way of slip that is impossible with gears, and would put a strain on the motor that would soon result disastrously.

Similar conditions, in a measure, are met with in a crank shaper, although the conditions are not as severe as with a planer. By using a motor with a speed range equal to the ratio of the back gear, it is possible to get an unbroken range of from 4.5 to 115.

An emery grinder imposes widely varying demands on the driving motor, considerable power being required to start the wheel from rest and decreasing as the wheel gains momentum and varying as more or less pressure is brought to bear against the face of the wheel in dressing the tool or other work.

Motors driving pipe-threading machines are subjected to severe treatment, as the motor must be stopped and started every time a new length of pipe is inserted. On heavy-duty machines this is done at intervals of two or three minutes, and besides the starting and stopping the operator usually juggles the chuck back and forth several times in setting up the jaws by means of the reversing starting equipment, which necessitates that that part of the equipment be both simple and rugged.

Drill presses, boring mills, milling machines, slotters and other machines on which a diversity of work requires different speeds on different metals and classes of work, all require a careful summary of conditions before deciding on the motor to be used to drive them. The majority of woodworking machines require high-speed motors and take less power per machine than in metal-working machinery, but the careful selection of motors is just as essential and the choice should not be made until every point in connection with the demand on the machine has been carefully considered.

In the average machine shop perhaps the engine lathe is most often required to work under varying speeds and conditions up to the limit of its capacity or up to the limit of output definitely fixed by the nature of the material or character of the work to be done. In changing from belt to motor drive the motor is usually mounted on a framing directly over the cone pulleys, milled gear being fitted on the larger cone and engaging either directly with a spur on the motor shaft or with an intermediate gear, if so desired; the starting apparatus, if automatic, may be placed either on the back of the lathe standards or on a nearby post or wall, and thus eliminate all exposed contacts on the lathe itself, only the push-button control, carrying but a fraction of an ampere, being installed on the machine, the conduit being secured to the frame in the least exposed place, and the control button at the most convenient point for the operator.

Some machine tools are now being built with the motor an integral part of the machine itself or with bosses cast on the frame and planed off ready for drilling for any motor base that the purchaser may wish to install for driving the machine. There is, too, apparently an effort on the part of manufacturers to bring the dimensions of standard sizes of motor frames within a certain limit to better facilitate mounting on machinery, due to the varied demand for different motors for certain machines.

In equipping a shaper, say 16-inch or larger, with motor drive for general uses in the average machine shop where either cone pulleys or a speed box has been used, the usual practice is to mount the motor on the standard of the shaper, under the overhang of the ram, that being the most advantageous location; gears or sprocket and chain may be utilized and with the ordinary four-cone pulley and one gear change, giving eight speed changes, in order to cover the full range of 6 to 96 strokes per minute, a jump of nearly 50 per cent takes place at each change.

The capacity of a shaper is its ability to remove definite amount of metal in the shortest time possible, and as a cutting rate of about 40 feet per minute is considered the practical limit for cast iron, the cone drive limits the efficiency to about 85 per cent, while with a variable-speed motor the efficiency is raised to approximately 100 per cent, due to the wide range of running speeds of the motor; the same may be said of the motor-driven lathe, both giving greatly increased output and on a smaller consumption of power.

In changing from cone pulley to motor drive the change gear is ordinarily retained, and it is usually found that the ratio of the back gear is greater than the square root of the total range covered, and by a proper choice of gears and pinions or sprocket and chain, a range of 4 to 96 or 6 to 144 or any range of 1 to 24 may be obtained.

The horsepower required for ordinary cast iron on shapers is about 0.4 horsepower per cubic inch of metal removed per minute; this covers the maximum power required during the cutting stoke and increased friction under load. The cutting speeds from which horsepower values are figured are based on conditions during approximately 90 per cent of the stroke length, based on the average cut of from one-eighth to three-sixteenths of an inch, from which other values, covering light, medium, heavy or extra heavy duty must be considered, depending on the average class of work and not what may periodically, or at infrequent intervals, be required.

The speed of a motor varies directly with the impressed voltage and inversely as the number of turns in the armature winding and as the field strength; the strength of a magnetic field varies as the strength of the field windings which energize the iron or steel of the poles, and inversely as the magnetic reluctance of the magnetic circuit, which latter is analogous to the resistance of the electric circuit. The lines of magnetic flux do not readily pass through the air but flow easily through iron or steel; therefore, the magnetic circuit of a motor, following the path of least resistance, starts in a pole piece, crosses the air gap to the armature through which it passes to the next pole piece, through it and so on around the entire frame to the initial starting point.

Since the air gap forms the part of greatest magnetic reluctance, any change in its length or area must therefore produce approximate changes in the field strength in which the armature turns, and a proportionate variation in speeds. There are three basic principles of speed control: (1) by changing the voltage impressed on the armature; (2) by changing the field magnetism; (3) by changing the number of conductors in series between brushes.

Under the first division, three-wire systems, multiple-voltage three and four-wire systems, booster, teaser and motor-generator systems may be utilized to secure the desired changes. Under the second division, interpole and compensated-wound motors, and motors in which either the pole pieces are movable radially or the armature movable laterally in the field, produce speed variations. Under the third division, the results are obtained by double-commutator motors and series-parallel control.

The speed of any motor is necessarily such that the generated counter electromotive force will be slightly less than the applied electromotive force of the line, the difference being just sufficient to force the required current through the resistance of the armature, which current is that necessary to produce the torque required to handle the load. If the speed drops below this value, the counter electromotive force decreases, which allows more current to flow through the armature, increasing the torque in excess of the load requirements and speeding up the motor. Thus the speed is automatically adjusted to a certain value which is practically constant so long as conditions are unchanged.

The demand for increased speed ranges in motors has brought out several unique types of motors with which it is possible to increase or decrease the speed gradually, without the use of any controlling apparatus other than an ordinary starting resistance, which makes them particularly adaptable to certain classes of work where changes of speed by the ordinary step method is objectionable.

In one of these the poles, four in number, are made to move radially in the frame, varying the magnetic reluctance to produce the speed variation. Each pole consists of two parts, a cylindrical shell in which the core or plunger moves being operated by a handwheel on the top of the frame which actuates screw rods and gears, which move all of the cores in unison; the pole face or shoe is a part of the pole shell and remains unchanged in its position, the core sliding within the shell.

When the core is "in", that is, in contact with the pole shoe, the reluctance is at its minimum and the motor operates at its slowest speed, and speeds up gradually as the core is withdrawn. The range of these motors is usually about 3 to 1, or a maximum increase of 200 per cent.

Another motor, of more recent production differs radically from anything else on the market, and is particularly adapted to machine-tool and printing machinery, as speed ranges of even ten to one are possible with it in either direction without special starting or controlling apparatus, and any desired speed may be obtained and maintained at any point between minimum and maximum with full rated capacity at all speeds; commutating poles give practically sparkless commutation even up to 50 per cent overload in either direction.

The wide speed range of this motor is obtained by the armature being so mounted on its shaft that it may be moved inward or outward in relation to the pole pieces. The commutating poles, which are in series with the armature, are not placed in direct alinement with the main field poles, but are laterally displaced in the direction in which the armature is withdrawn; both pole faces and armature are slightly tapered, as one truncated cone within another, with the shaft as the axis; thus the distance between the pole faces and armature increases or decreases with the lateral shifting of the armature.

The normal position of the armature is, of course, directly under the main pole faces, at which point the air gap is at its minimum, and owing to the cone-shaped armature and pole faces, it is necessary to displace the armature but little in order to materially increase the air gap and thus produce

a change in speed. As the armature is withdrawn gradually it passes out of direct line with the main pole faces and into the field of the interpoles, increasing the magnetic reluctance and decreasing the field strength, resulting in increased speed.

The tendency to sparking as the armature is shifted into a weaker field is overcome by the laterally displaced interpoles, which, as the armature moves into the weaker field, exert an increasing effect on the armature, the commutating effect increasing proportionately to the work to be done; the interpoles also act as speed-regulating poles as the armature is withdrawn from the main poles, reducing the speed drop from no load to full load to a minimum.

A handwheel at the rear end of the motor operates a threaded rod carrying an adjustment nut which operates a lever that shifts the bearing box and yoke in which the shaft slides axially and which also contains a ball bearing that receives the end thrust of the displacement as well as the radial load on that end of the shaft; this thrust bearing box carries the brush rigging as well as the armature and the thrust is balanced by a helical spring on the rod to reduce the effort necessary to shift the mechanism by the handwheel.

The choosing of proper starting and conrtolling equipment is as important as the choosing of the proper motor, for without the proper auxiliary equipment a variety of troubles are likely to be experienced. In starting a direct-current motor it is necessary to introduce sufficient resistance into the armature circuit to reduce the inrush current to a safe value, gradually cutting out the resistance until the motor is thrown across the line; if this is properly done gradually, no trouble results; it is the improper handling of the starter that is nearly always responsible for blown fuses, burned contacts, punctured insulation, grounds and damaged commutators, all due to careless or reckless handling by operatives who, either through ignorance, impatience or even spite, fail to follow instructions given.

A variety of conditions are imposed on both motors and controlling apparatus, both of which require careful handling and manipulation and watchfulness against accidental damage, especially so if automatic control is not used. Such control equipment must prevent excessive starting current and at the same time be neither too slow nor too fast; it must be so located on or near the machine as to save the operator's time in manipulating. Where frequent stopping, starting and reversing is required, a controller with dynamic brake is recommended, as it enables quick stopping to caliper work, change tools or set up work. Apparatus having sliding contacts, dash-pots and other complicated parts which are easily disarranged, shunt-regulating coils, etc., are best avoided where non-technical operatives have to operate same.

With proper controlling apparatus a motor may be started with the tool of the machine embedded in a heavy cut without an excessive strain being thrown on the motor. Magnetic-type switches with push-button control are recommended, as the push-button can be placed at almost any convenient place on the machine within easy reach of the operator.

There has recently been placed on the market an automatic starting equipment which is claimed to be absolutely fool-proof; this consists of a bank of starting resistances and a train of magnetically operated switches for cutting out this resistance. The actuating windings of these switches may be connected in series with the motor and the switches are so constructed that they perform also the function of a current-limit relay; as when the starting current exceeds a predetermined value the switch locks and cannot close, but as soon as the motor speeds up sufficiently to reduce the current, the switch then closes, automatically short-circuiting the sections of resistance.

When the line switch is closed this allows current to flow through the motor and all of the starting resistance and the first series-wound accelerating switch; as soon as the speed of the motor reaches the point where the current falls back to approximately full-load value, the first accelerating switch closes and cuts out the resistance; and this same operation is repeated until each of the accelerating switches has in its turn closed and cut out all of the resistance, putting the motor directly across the line.

This is all accomplished automatically, limiting the starting current to safe value, bringing the motor up to speed according to the load and without placing any strain on the motor. A no-voltage device disconnects the motor from the line and it cannot again be started until a push-button is operated. The controller, of drum type, gives forward, reverse, drift, and off point. A dynamic brake is thrown on at the "off" position and at the "drift" the motor is disconnected from the line.

Several different styles of starters are made and are meeting with favor by users of motors in manufacturing concerns where motors are subjected to heavy duty and trouble had been experienced with the ordinary hand-operated starters. One style provides for instant reversal under full speed, the motor coming to almost instant stop and reversing, all without the least sparking at the brushes or strain on the motor.

Most large users of motors for driving machine tools are coming to realize that while automatic control means a higher original investment, it is cheaper in the end, as the saving in maintenance and repair amounts to more than the added cost of the better equipment, and also means a higher efficiency, greater output per machine and takes the responsibility for much lost time, damaged equipment and poor results off the men operating the machines.

Aluminum Conductors in Mines.

Burkewood Welbourn has been urging mining engineers in England to investigate the merits of aluminum for transmission cables in collieries, as transmission may account for 50 per cent of the cost of electrical equipment. The world's annual production of copper is 1,004,485 tons, and of aluminum about 60,000 tons, about 15 per cent of the latter (say 10,000 tons) being used in electrical work. Mr. Welbourn calculates this as equivalent to 20,000 tons of copper, and quotes the above figures to show that aluminum has not so far made any serious impression on the use of copper for electrical work. Further, plants now under construction will increase by 50 per cent the present aluminum output within the next two or three years. Improvements in manufacturing methods, he predicts, will reduce production cost and selling price, resulting in more extensive use electrically, unless copper prices likewise fall.

A comparison of prices of insulated copper and aluminum cable at March, 1913, prices (electrolyte copper bars, 2,240 pounds to ton, $346; aluminum $453) showed that for mining work in the United Kingdom, insulated cables with copper conductors and for all pressures, were the cheaper, while for overhead lines, aluminum conductors were the cheaper. Paper-insulated, lead-sheathed cables were shown to be cheaper than bitumen-insulated cables, whether aluminum or copper.

In a comprehensive study of the matter before the Institution of Mining Engineers in London on June 5, Mr. Welbourn referred to his investigation of three cases that had occurred in the United Kingdom during the past ten years, in which aluminum conductors had given unsatisfactory results. He said that these failures were due to inferior metal and insufficient knowledge of working it at the time.

Jovian Rejuvenation at Chicago.

The members of the Jovian Order in Chicago may well feel proud of the monster rejuvenation which was held on the occasion of the thirty-sixth convention of the National Electric Light Association, at White City on June 5. A class of 187 candidates was initiated, and there were 776 covers laid for the supper which followed the rejuvenation. A number of distinguished men were present as guests of the Jovian Order, including F. M. Tait, James H. McGraw, James M. Wakeman, D. T. Pierce, John F. Gilchrist, B. M. Downs, F. C. Bates, W. F. Wells and J. Robert Crouse. The eral arrangement committee, F. P. Vose, chairman of the banquet committee, E. H. Waddington chairman of the committee handling applications and registration. C. R. Kreider, chairman of the committee for the reception of candidates. The degree team included George C. Richards, Jupiter; W. E. Finley, Neptune; J. W. Foster, Mars; L. M. Willey, Pluto; R. E. Macduff, Apollo; O. L. Johnson, Hercules; A. J. Selzer, Avrenim; T. C. Hawkins, Vulcan and W. E. Bischoff, Mercury.

Jovians at Monster Rejuvenation Held at Chicago, June 5.

only speaker of the evening was Frank E. Watts, Jupiter of the Jovian Order, and during the supper a cabaret performance of six numbers was given.

The committees in charge of arrangements, under the direction of George C. Richards, Statesman for Illinois, deserves great credit for this rejuvenation, which initiated the largest class in the history of Jovianism, brought together the greatest gathering of Jovians ever seated at one place, and listened to the shortest speech ever made by Jupiter.

Assisting Mr. Richards were A. R. Dean, alternate statesman for Illinois; Mike S. Hart, P. F. Lyons, F. P. Vose and A. A. Gray, Statesmen-at-Large. A. R. Dean was chairman of the gen-

Increase in Aluminum Production.

The year 1912 in the aluminum industry was marked by a notable increase in the use of that metal, more than 65,000,000 pounds being consumed, compared with 46,125,000 pounds in the preceding year. Not only was there an increase in the domestic production but there was a decided growth in the imports of the metal.

To meet in part the growing demand for aluminum, the Southern Aluminum Company, with a large capital, has acquired a water-power site on Yadkin River, North Carolina, and is now engaged in the development of the property.

The Aluminum Company of America has secured certain riparian rights in North Carolina and Tennessee and is planning development of a water power for use in an aluminum plant to be constructed at such point as will insure good freight rates and an adequate labor supply. In addition to this expansion in the South, the company is reported to be working on additions to its New York, Pennsylvania, and Illinois plants.

The domestic production of bauxite, the ore from which aluminum is derived, during 1912 was 159,865 long tons, valued at $768,932. Compared with the output in the preceding year, these figures represent an increase in quantity of 4,247 long tons, and in value of $18,283. It is significant, however, that the importation of metallic aluminum of different grades increased enormously in 1912 over previous years.

As soon as the process for the extraction of aluminum from clay is put on a commercial basis, the large quantities of low-grade bauxite containing considerable admixtures of clay will become available. There is a large tonnage of such material associated with most of the southern Appalachian bauxite deposits. Two processes have recently been patented for the extraction of alumina from clay, and other patents, having for their object the extraction of potash salts and alumina from silicates like the feldspars, were taken out during 1912.

Difference in Strength of Day and Night Signals in Radiotelegraphy.

The first explanation given of the difference in strength of day and night signals after the discovery of the phenomenon by Marconi, was that sunlight, by ionizing the air around the sending antenna, produced energy losses which resulted in a decrease in the strength of the received signals. This idea has long been abandoned as affording a full explanation of the phenomenon, says L. W. Austin, of the United States Naval Radiotelegraphic Laboratory, in the *Journal of the Washington Academy of Sciences.* Recent observations between the Arlington station and the station at the Bureau of Standards, 8 kilometers apart, show that if the effect exists at all it is a matter of no more than 1 or 2 per cent.

At a later period it was supposed by many workers in radiotelegraphy that the increase in strength of signals at night was caused by the decrease in absorption in the upper conducting layers of the atmosphere after the ionization due to the sunlight and possible cathode rays from the sun had ceased.

The data accumulated by the United States Navy Department during the last three years appear to make this explanation improbable for the two following reasons: (1) It is known that in certain regions and at certain wave-lengths the ground absorption is more than 20 times as great as would be the case if the signals were sent over salt water. The sun's rays can hardly be thought to affect the losses in the earth to any extent, yet on some nights these waves travel across the same region, reaching the receiving station with a great strength as would have been the case if there had been no absorption at all. (2) Observations on undamped oscillations from the arc have shown that at night there is a selective strengthening and weakening of the signals with changing wave-length. For example, during the recent tests of the arc at Arlington, it was found that when the night signals at the receiving station were faint at the regular wave-length of 4,100 meters, changing to 3,950 meters would almost invariably bring them in with greatly increased strength and *vice versa.* This suggests the light and dark interference bands of optics and, as Dr. De Forest has suggested, the phenomenon may be explained by the interference of a set of waves traveling along the earth's surface with another set which has been reflected from the conducting layers of the upper atmosphere. Calculations show that the height of the reflecting surface would be from 40 to 60 miles, which are very probable values for the point at which conductivity would begin. This phenomenon has been observed so constantly in the work with the arc that there can be absolutely no doubt of its existence. The fact that it has not been observed in the case of spark waves is due partly to the fact that spark apparatus is generally not changed in wave-lengths by such small percentage of steps, and partly to the shortness of the wave trains which would not permit the direct and deflected trains to overlap for any considerable difference of path.

These facts indicate that the greater strength of night signals is probably due not to a decrease in absorption, but rather to additional energy which reaches the receiving station by reflection. This explanation would involve the idea that at night the upper atmosphere becomes stratified in such a way that at some given height differing at different times, there is a sufficiently sudden change in conductivity to permit reflection. It is conceivable that this stratification is broken up in the day time either by vertical convection currents, or by the more or less irregular ionization produced by the ultra-violet rays or cathode particles from the sun.

It is certain that the difference between night and day signals is much less for long waves than for short, but the observations on the Clifden signals (wave-length about 7,000 meters) at Brant Rock (2,460 miles) and at Arlington (2,840 miles) do not agree with the observations of Marconi at Glace Bay that the day signals are equal to or better than those at night. At Brant Rock during the autumn and winter the received current from Clifden through 25 ohms resistance was in general about 35 micro-amperes in the day time, rising at times to 55, while at night the current frequently amounted to more than 100. In summer the signals were always faint and much of the time inaudible in the day time, varying probably between 7 and 12 micro-amperes. Night signals were much louder, no exact measurements being made on them. The observations on Clifden at Arlington agree qualitatively with the Brant Rock results.

The Italian government proposes the construction of a dam across the River Tirso in Sardinia to create a reservoir with a perimeter of about 40 miles. Although primarily for irrigation, this reservoir would also supply about 10,000 horsepower through hydroelectric development. A similar project is contemplated in Calabria.

Preservative Treatment of Poles.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 30, 1912 (page 1014) was published the preliminary report issued by the United States Bureau of the Census on the number of wooden poles purchased in this country during 1911 by steam and electric railroads, electric light and power companies, and telegraph and telephone companies. In a final report on the subject that is about to be issued the data already published are included together with additional comments on the preservative treatment of pole timbers. This portion of the final report is as follows.

The woods used for poles in the United States are chiefly those which are naturally very durable in contact with the soil. The life of timber under this condition varies considerably according to the species, to differences in the wood of the same species, to the character of the soil and to climatic conditions. Cedar, chestnut, cypress, juniper, redwood usually last from 10 to 15 years, while white oak has an average life of somewhat less than 10 years.

The resistance of the poles to decay can be considerably increased by the use of preservatives. Wood preservation is now on a firm footing in the United States, but the advantages which this practice affords are by no means fully utilized by pole consumers. Preservatives not only add from 3 to 15 years or more to the service of the woods now commonly used for poles, but also make it possible to use cheaper woods which in their natural condition lack durability in the soil, although possessing all the other qualities necessary in pole timber. The durability of woods which ordinarily last but a few years can thus be increased to more than double the normal life of cedar.

The principal preservatives used for treating poles are those classified as refined coal-tar oils. Under this heading are included creosote oil and various proprietary preservatives. During 1911 creosote oil was used in treating 159,321 poles, of which 50,021 were cedar and 83,035 yellow pine.

The cost of treating poles varies according to the wood treated, the kind of preservative and quantity used, and the process employed, but it is only in rare instances that the adoption of a pole-treating policy is not economical. The United States Forest Service has a large number of poles treated by different methods under record and subject to annual inspection in order to determine the relative values of the different methods and preservatives.

Lighting the Camp of Veterans at the Gettysburg Anniversary.

The State of Pennsylvania has arranged for the celebration of the fiftieth anniversary of the Battle of Gettysburg by means of appropriate exercises and a camp of veterans of the Civil War, accommodations being provided for 40,000 men. This camp has been located just outside of the town, about 200 feet from the high-water mark monument, and lies partly upon the scene of the first day's fight. There will be 5,000 tents arranged to accommodate eight veterans each, and in addition a large assembly tent.

Exercises will be held on July 1, 2, 3 and 4, but the contract for lighting covers the period from June 15 to July 10.

A battalion of the United States Signal Corps is placing about 100 telephones in different parts of the camp and the battlefield park, which involves the stringing of many miles of wire. The contract for the temporary lighting system for the camp was given to the Gettysburg Lighting Company and the information and illustrations given here are through the courtesy of T. P. Turner, general manager of the Company.

This contract was signed on March 10 and required the placing of 500 sixty-candlepower, 6.6-ampere series tungsten lamps by May 15. On account of rainy weather, etc., the entire work was completed in 20 working days. There were required 635 poles and 500 fixtures, in addition to transformers and other apparatus. Chestnut poles cut in the vicinity were used. These were 22 feet long, with four-inch tops. The line work was done from lightly constructed towers mounted on wagons, as shown in Fig. 1. The line was supplied from a substation in which Westinghouse constant-current regulating transformers were installed, as shown in Fig. 2. The 500 lamps were distributed over 20 miles of streets and avenues in the camp. Bryan-Marsh lamps were used and were mounted in Hubbell fixtures. The wire was supplied by the Phillips Insulated Wire Company.

The first lamps were turned on May 7 to light the tents of officers of the Fifth Battalion of regular infantry, which was stationed there to guard government property, and the street lights were turned on for the first time on the night of May 15. The contract requires that the lighting system shall be removed by August 10.

In addition to the lighting of the camp it was necessary to drill four wells to a depth of about 500 feet in order to furnish 250 gallons of water per minute. Four tanks were erected, each with a capacity of 50,000 gallons, and 32,000 feet of pipe were laid for conveying water through the camp.

Fig. 1.—Method of Constructing Line.

Fig. 2.—Transformers in Substation.

Electric Fatigue.

The English Institution of Electrical Engineers has accepted for publication in its *Proceedings* a communication on the nature of electric fatigue, by W. Holttum. The method of testing, apparatus employed, and test results and deductions therefrom, are all detailed, the following conclusions resulting:

(1) That fatigue due to electric stress alone is almost negligible for ebonite and presspahn until the point of breakdown is approached, the greatest amount measured for ebonite being two per cent of the initial instantaneous strength.

(2) That the least pressure which will cause breakdown if applied continuously is about eighty per cent of the lowest measured value to which the instantaneous strength can be reduced by fatigue.

The conclusion of the greatest practical importance that can be drawn from the tests is that the electric strength of ebonite for sudden stresses lasting for a fraction of a second is only about 28 per cent greater than it is for long continued stress, and that any ebonite used for insulation purposes should be designed for the greatest pressure which may occur as though that pressure were continuous.

Mr. Holttum's work was carried out at the laboratories of applied electricity at Liverpool University.

Alcock Patent on Electric Signs Upheld.

In the suit of the O. J. Gude Company, of New York, complainant, vs. the A. & W. Electric Sign Company, of Cleveland, O., defendant, based on the patent to Alcock, No. 648,677, issued May 1, 1900, on an application filed July 7, 1899, District Judge Day, in the United States District Court for the Northern District of Ohio, Eastern Division, holds that the patent is valid and has been infringed by the defendant. The opinion was handed down in Cleveland, on May 28.

The patent discloses the figure of a man with representations of several different attitudes or positions, all of which are taken by the figure or the arm thereof, in making a given movement; an illusion of movement being created by successively lighting the lamps which outline the different positions of the moving part of the figure, while the balance of the figure remains lighted at all times.

The claims of the patent are as follows: (1) "In an illuminated advertising device the combination with the representation of a figure in several attitudes or positions which would be successively taken up by the figure in making a given movement. Electric lamps arranged on a number of cir-

cuits and one or more which is common to two or more attitudes or positions of the figure and others of which are only lighted up when the figure is shown in one of its several attitudes or positions and a switch controlling the lamp section. The movable contact of which will complete each of several of the circuits in consecutive order and approximately simultaneously with the breaking of each preceding circuit as set forth."

(2) "In an advertising device the combination of several groups of electric incandescent lamps so arranged on several circuits as to form or illuminate the outline of a design or figure or portion thereof, in different attitudes; some of said groups being common to two or more attitudes, with switching mechanism by which the operation of the groups of lamps on one circuit are switched off simultaneously or nearly simultaneously with the switching on of the circuit of the succeeding group of lamps thereby making the design or figure appear to assume different attitudes substantially as described."

The alleged infringing sign constructed by the defendant consists of the representation of a chariot race, the horses of which are given an illusion of movement by the successive lighting and distinguishing of lamps outlining the legs of the horses in different positions. The wheels of the chariot also appear to revolve and the cloak of the man to wave in the wind, while other portions of the design are stationary, and these outlines remain permanently lighted."

The defendant introduced testimony purporting to show prior publication, indicating a device known as a flying fish; also an electrical tower in Minneapolis, in 1890, another electrical tower at the Chicago World's Fair in 1893, and an American flag with a lighted staff, the light so arranged as to be successively lighted and turned off to produce the illusion that the flag is waving or moving in folds. Testimony was also given of different illuminating designs which were claimed to cover the patent in suit, and so anticipating the novelty of the invention. The latter testimony Judge Day held was not corroborated, and not sufficient to establish the prior uses referred to. The other testimony referring to the devices alluded to, Judge Day thought did not combine the features of the patent in suit.

This is a very important patent insofar as the illusion effect of an electric sign is concerned. The defendant, the A. & W. Electric Sign Company, has decided to continue this litigation, and its attorney will file a motion to re-open the case.

PRIME MOVERS FOR ELECTRIC POWER.[1]

By S. Z. de Ferranti.

Notwithstanding the amount that has been written regarding the different systems of driving electric generators, the subject still seems to be one of considerable interest. The position today is that the steam turbine is in possession of the field, and that gas and oil engines are looked upon as likely alternatives. Many people believe that it is only prejudice or the fear of doing something new that prevents engineers from using these two latter methods for generating their power. I do not, however, agree with this view, and believe that engineers are using the only means that are at present economically available for the work they have to do.

Electricity is being produced on a larger scale every day, and it appears certain that to obtain the full benefits of electric working the current must be produced in large stations supplying extensive areas embracing all classes of demand. As we are dealing with prime movers for electric power, I will, therefore, consider the question from the point of view of the comparatively large generating station. The essential qualities of a power-producing plant are reliability and low cost as regards capital, running and maintenance.

The question before us may be considered in detail under the following headings: (1) Nature of fuel consumed, its availability and cost. (2) Amount of fuel consumed per unit generated. (3) Standby losses. (4) Labor involved in running. (5) Cost of upkeep of plant. (6) Capital cost of plant. (7) Size of units, simplicity or complication. (8) Reliability and proved capacity for work required.

As we are a coal-producing country it is evident that coal is our natural fuel. The very fact of oil being so sought after as fuel for certain purposes puts it out of the question for general power production. In the first place, the automobile on land must consume and even now consumes large quantities of light oil. For the Navy oil is so eminently suitable as fuel that the demand in this direction will always raise its price above that due to its heat value. Furthermore, if there is ever a surplus after supplying the Navy, there remains the vast and ever increasing demand by the mercantile marine which will always be able to pay more for it than land consumers could do.

It is, therefore, clear that coal must be our fuel where operations are carried on on a large scale. In the future, the oil consumers above mentioned will even be partly supplied from the by-products of our coal, instead of our burning any appreciable amount of oil for making electricity.

It is, therefore, vital that our power-producing plant should be coal burning. The plant must be made suitable for the fuel, and not fuel found to suit a particular form of machinery.

We have next to consider the thermal efficiency of the plant for producing electricity. By this I mean the percentage of the heat in the fuel turned into current.

A good steam turbine and boiler plant will today give back 15 per cent of the energy of the fuel as electricity. As high an efficiency as 18.5 per cent has actually been obtained in practice. It is probable, however, that this is by no means the limit of economy and that developments in this class of machinery will result in an efficiency of 25 per cent being obtained in the near future.

The next coal-burning machine that we have to consider is the gas engine. With it we have to consider not only the efficiency of the machine itself, but also that of the gas-producing plant. When the system is considered from this point of view its efficiency is probably between 20 and 22 per cent.

With this process there should, of course, be worked by-product recovery. Although it appears evident that in the future all coal must be gasified and its by-products recovered, it does not seem that present knowledge enables this to be done at sufficient profit for it to be generally adopted.

In the oil engine we have a machine which represents the highest efficiency yet realized. Moreover, test figures and those obtained in practice agree very closely. The efficiency as already defined may be taken at between 28 and 30 per cent.

The question of stand-bye losses may next be considered. In the oil engine there is practically no loss under this heading. In the gas engine there is the producer loss, and in the turbine the boiler loss. These will vary very much with the nature of the load, and where the plant is well designed and run, and the load-factor is good, they may be reduced to a small quanity. Both the oil engine and the gas engine are, however, badly handicapped in relation to the steam turbine by their incapacity for dealing with overloads which the station must always be in a position to meet.

With regard to the question of the labor involved in running and maintaining the plant, as matters stand today the turbine installation is undoubtedly the best, but it is hard to make a direct comparison as the number of generating units with either gas or oil would be so great. It is, however, certain that the plant which is the simplest will always have the advantage, and where one is purely rotary and the other reciprocating there can be no question at all.

In the matter of capital cost the turbine

1 Paper presented at annual convention of Incorporated Municipal Electrical Association, London, England, June 17-20.

system is again much the best, the simplicity, large units and small space occupied contributing to this result. The size of the units on the turbine system compared with those on the other systems is perhaps the greatest determining factor in the case. The turbine is today adequate in fulfilling the demand, whereas the other two systems are not. Moreover, combined with its boiler and auxiliary plant, it is a simple means of generating power.

Reliability of operation is, of course, vital, and here again the turbine system scores on account of its great simplicity and because in working, its parts are not subjected to either high or uncertain stresses.

In practice the turbine system has proved its capacity to meet the demand that is made on power-producing plant. All this goes to show that the course now followed by engineers in the selection of their plant is the right one, and that they really have no option in the matter.

Looking at the question in the light of possible developments of the future, I cannot help thinking that as long as engines are used the rotary principle will be followed. For the moment the steam-turbine system will be perfected so as to improve its efficiency and fuel consumption; later on, when the turbine can be made of the internal-combustion type, still better economies will be obtained.

E. W. Rice, Jr., Becomes President of the General Electric Company.

The resignation of C. A. Coffin as president of the General Electric Company, and his election as chairman of the board of directors, have been announced at the company's offices. Mr. Coffin was succeeded to the presidency by E. W. Rice, Jr. Under the presidency of Mr. Coffin the General Electric Company has had a most remarkable expansion both as a manufacturing and financial institution.

Mr. Rice is not only an engineer—he is a business man, a constructive genius and an executive of demonstrated ability. He graduated from the Philadelphia High School in 1880, and shortly after became assistant to Elihu Thomson. He joined the forces of the American Electrical Company at New Britain, Conn., which was later on acquired by other interests and transferred to Lynn, Mass., under the name of the Thomson-Houston Electric Company. While still in his twenties, Mr. Rice became superintendent of the Lynn plant. When the Edison and Thomson-Houston companies were united to form the present General Electric Company, Mr. Rice became prominently identified with the new corporation, and in 1893 was appointed chief engineer. Three years later, in addition to his duties as technical director, he was made third vice-president of the General Electric Company, in that capacity harmonizing the technical and commercial interests of the business.

Railway Telegraph Superintendents.

At the annual meeting of the Association of Railway Telegraph Superintendents, which was held at the Planters Hotel, St. Louis, Mo., May 20 to 23, inclusive, the following officers were elected:

President, William Bennett, Chicago & Northwestern Railway, Chicago.

First vice-president, A. B. Taylor, New York Central Lines, New York, N. Y.

Second vice-president, W. C. Walstrum, Norfolk & Western Railroad, Roanoke, Va.

Secretary and treasurer, P. W. Drew, Minneapolis, St. Paul & Sault Ste. Marie Railroad, Chicago, Ill.

The next convention will be held at New Orleans, La., from May 19 to 22, inclusive. Among the exhibitors were the National Electrical Specialty Company, Chicago; National India Rubber Company, Bristol, R. I.; The Railway Electric Manufacturing Company, Chicago; Central Electric Company, Chicago; Western Electric Company, Chicago; Thomas A. Edison, Incorporated, Orange, N. J.; Automatic Electric Company, Chicago, and J. H. Bunnell & Company, Incorporated, New York.

Among those present were Avery P. Eckert, J. Lorenz, G. M. Cox, G. H. Heyer, R. F. Spamer, R. L. Hill, J. A. Kick, E. V. Adams, G. E. Cullinan, E. E. Hudson, J. H. Finley and J. J. Ghegan.

An informal dinner and entertainment was tendered to the members and ladies by the St. Louis League of Electrical Interests. W. J. Hiss, general manager of the Southwestern Telephone & Telegraph Company, St. Louis, was the toastmaster. There was also a banquet tendered the visitors by the Southwestern Telephone & Telegraph Company, followed by a vaudeville program.

Steam Railway Conventions at Atlantic City.

The annual convention of the American Railway Master Mechanics' Association was held at Atlantic City, N. J., from June 11 to June 13, inclusive.

The following officers were elected for the ensuing year:

President, D. R. McBain.
First vice-president, F. F. Gaines.
Second vice-president, E. W. Pratt.
Third vice-president, William Schlafge.
Treasurer, Angus Sinclair.
Executive members for two years: W. J. Tollerton, J. F. DeVoy and J. T. Wallis. F. H. Clark elected for one year.

The semi-annual meeting of the Association of Railway Electrical Engineers was held at the Dennis Hotel, Atlantic City, June 16.

The annual meeting of the Railway Supply Manufacturers' Association was held at Atlantic City on Saturday morning, June 14.

The convention of the Master Car Builders' Association was held on Monday, Tuesday and Wednesday, June 16-18.

The conventions were well attended, over 3,000 members and guests being present. There were 273 exhibitors occupying all of the available space on the million-dollar pier. Among the electrical interests exhibiting were the following:

Herman Bocker & Company, Carborundum Company, Cooper Hewitt Electric Company, Dearborn Chemical Company, Joseph Dixon Crucible Company, Edison Storage Battery Company, Electric Controller & Manufacturing Company, Electric Storage Battery Company, Elwell-Parker Electric Company, General Electric Company, William Jessop & Sons, Incorporated, Okonite Company, Pyrene Manufacturing Company, Reliance Electric & Engineering Company, Sprague Electric Works of General Electric Company, U. S. Light & Heating Company, Westinghouse Electric & Manufacturing Company.

Mandatory Electrification of Chicago Railroad Terminals Highly Probable.

By the decisive vote of 12 to 1 the Committee on Railroad Terminals of the Chicago City Council has recommended for passage an ordinance introduced by Alderman Theodore K. Long making it mandatory upon the numerous steam railroads having terminals or tracks in the city of Chicago to adopt before July 1, 1915, some other means of motive power aside from the use of steam or any means productive of smoke and gases. Although this ordinance does not specifically require electrification of the railroad terminals, yet it is generally conceded that not only is that its aim but through electrification only can the ordinance be carried out. There is considerable probability of the passage of this ordinance.

It is believed that while this ordinance makes it mandatory for the railroads to abandon the use of steam power before July 1, 1915, this requirement will not be carried out strictly, but the passage of the ordinance may be taken as a definite announcement of the city's policy.

BOOK REVIEWS.

"Magnetism and Electricity." By E. E. Brooks and A. W. Poyser. London: Longmans, Green & Company. Cloth, 633 pages (5½x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.00.

This book is called "A Manual for Students in Advanced Classes," and the authors state in the preface that its scope is that required for the pass examinations of the English universities, and for the examinations of the Board of Education. It is more inclusive and complete than the books generally used in undergraduate courses required in American colleges and technical schools; it makes no use, however, of any mathematics more advanced than trigonometry. It is intended to meet the needs both of students of pure science and of students who intend to take up electrical engineering, and the authors have succeeded very well in choosing subject matter of importance to both classes of students.

The book was written to replace Poyser's "Advanced Magnetism and Electricity," originally published in 1892; but the present volume is an entirely new piece of work, and not merely a revision of the earlier one.

The first 100 pages are devoted to electrostatics, the next 75 to magnetism, and the next 200 to electric currents, including their chemical and magnetic effects; after that, chapters follow on the theory of magnetization, alternating currents, inductances, thermoelectricity, and discharge in gases. The remaining chapters, occupying about 100 pages, are devoted to applications—the telegraph and telephone, dynamos, lamps, practical measuring instruments, and wireless applications—and to units and dimensions.

The authors make very frequent use of the method of presentation of giving directions for the performance of an experiment, and then discussing its results. About 250 experiments are given in all. These are demonstration experiments, such as would be performed in lectures and not laboratory measurements.

The style is exceedingly clear, and the presentation admirably adapted to the probable mental content of the reader. The authors have a happy faculty, no doubt acquired in their experience as teachers, of foreseeing and guarding against the sort of misunderstandings that are likely to arise in the mind of a reader not yet familiar with the subject. The reviewer has seldom read any book in which this is better done than in the volume under discussion.

The authors have taken pains to include the dielectric capacity (K) and magnetic permeability (μ) in all statements, formulas or equations in which these quantities properly occur, but are omitted by some writers. This is both scientifically correct, and also easier for the student than to ignore K and μ as long as phenomena are supposed to occur in air, only to introduce them later. Another matter in which the authors deserve commendation is that of clearly distinguishing between electric field strength and electric force, the latter being $1/K$ times the former; and between magnetic field strength and magnetic induction. These concepts are too often confused.

Some criticism must be made in regard to the treatment of units. The ampere is defined on page 207 as the current which flows through a resistance of one ohm when the potential difference across it is one volt. Somewhat later it is shown that a current can be defined in terms of its magnetic effects; but no mention of the correct definition of the ampere, in terms of the deposition of silver, is made until near the end of the book, and then only in fine print. The reader could hardly fail to get the impression that the true definition of the ampere is based on the magnetic effects of a current. The same fault can be found with the treatment of the ohm and the volt. Specific resistances are given in "ohms per centimeter-cube," although resistance is not proportional to volume, and ought more correctly to be expressed in ohm-centimeters. Insulation resistances are expressed in "megohms per mile," instead of "megohm-miles." Among magnetic units bare mention is made of the gauss, and none at all of the maxwell, gilbert or oersted.

In the very excellent chapter on telegraphy, no mention is made of the closed-circuit system generally used in the United States.

These criticisms, however, are of altogether minor importance in comparison to the general excellence of the book. Its subject-matter is well chosen; it is excellently written; its typographical work has been exceedingly well done; and it deserves to be widely used.

J. R. Benton.

"Electrical Engineering for Mechanical and Mining Engineers." By H. J. S. Heather. London: Electrician Printing & Publishing Company. Cloth, 332 pages (5½ x 8¼ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.50.

This book is in the form of 20 lectures as given to the resident mechanical engineers in charge of the gold mines of the Witwatersrand, South Africa. The book is not intended to give a general knowledge of electrical engineering but to train men who have been in charge of steam plants and other mechanical apparatus so that they could properly care for the electrical apparatus which was to be installed in that district. Throughout the work fundamental ideas founded on experimental data are presented and from them results are predicted and discussed. There are few mathematical discussions in the book and the formulas used are of simple form. The elementary calculations of resistance, reluctance, impedance, power, power-factor and other electrical qualities are given. The use of vector diagrams for alternating-current phenomena is explained and applied. At the end of each chapter a full set of questions is found.

The book is full of practical observations and although not complete enough for one who wishes to cover the ground in detail, it is well fitted to give one a working knowledge of the behavior of direct and alternating-current apparatus and the reasons for such. It is well adapted for use by the engineer who wishes to review the subject of electrical engineering and to get a comprehensive view of the whole field as it is at present. The treatment is exhaustive in its description of the action of present-day apparatus.

The book covers the subjects of electric currents (direct and alternating), resistance, the peculiarities of alternating phenomena, electrical measurements, generators and motors and their peculiar characteristics. The transformer is used to introduce the polyphase transmission of energy and the induction motor. The last chapter shows the effect of operation under conditions different from those for which the apparatus was designed. A good index is found at the end of the book.

The book is well written and fulfills its purpose as stated by the author in his preface. It is an excellent book for the engineer who is to care for the proper operation of a plant and who must understand its operation but who has either forgotten his college work in electrical engineering or who has not had the benefits of such work

Arthur M. Greene, Jr.

"A Primer of the Internal Combustion Engine." By H. E. Wimperis. New York: D. Van Nostrand Company. Cloth, 143 pages (4¾ x 7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.00.

This little book is intended as an introduction to the study of internal-combustion engines. It contains a short survey of the history of the gas engine and oil engine, a discussion of fuels used, the elementary theory of thermodynamics applicable to these machines, and the description of well known engines for stationary, marine and aeroplane service and their peculiar details. The discussion of the ideal engine brings out the effect of clearance, the peculiar features of constant-volume, constant-pressure and constant-temperature cycles and the action of gases when exploding. Ignition, governing, and the use of carburet-

ters are considered in one chapter and the book closes with a chapter on the testing of these engines.

The book gives a general view of the present position of the gas engine but in order to cover the ground in a small compass all matter receives a short treatment. The theoretical discussions are therefore not conclusive and although the name entropy is introduced there is no good conception of its meaning or use in the book and the reader is referred to another book for "a fuller idea of entropy." The one criticism of this work is the introduction of such theoretic matter for men who are not supposed to be prepared for it. It is a waste of time to devote any study on a primer of a subject containing matter insufficiently presented when this same matter is to be considered again after the student is prepared.

The use of the centigrade heat unit (one pound of water raised one degree centigrade) is deplored, as it introduces one more unit without any gain. This unit is not used to any extent. Most tabular data are in the British thermal unit or calorie. If the centigrade degree was desired, why not include the kilogram also and use the calorie?

The book contains a large number of problems and answers and a good index. A meager bibliography is found at the end. The book is well written and presents a comprehensive view of the subject in a small space.

ARTHUR M. GREENE, JR.

"Cyclopedia of Telephony and Telegraphy". Four volumes. Chicago: American School of Correspondence. Cloth, 1573 pages, total, (6½x9½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $12.80.

The "Cyclopedia of Telephony and Telegraphy" may readily be considered as a textbook on the whole art of the electrical transmission of intelligence as it represents, comprehensively, authoritative treatment of the entire subject. The sections on telephony cover the installation, maintenance, and operation of all standard types of telephone systems; they present without prejudice the respective merits of manual and automatic exchanges; and they give special attention to the prevention and handling of operating troubles.

The sections on telegraphy cover both commercial service and train dispatching. Practical methods of wireless communication, both by telephone and telegraph, are also rather fully treated.

The treatment throughout is nontechnical and has been simplified as far as possible. This feature should appeal to the employee or student without technical education who desires a thorough working knowledge of telephony or telegraphy.

The first three volumes of the cyclopedia are devoted to telephony and contain the following chapters, all prepared by K. B. Miller and S. G. McMeen: Fundamental Principles; Substations; Party-Line Systems; Protection; Manual Switchboards; Automatic Systems; Power Plants and Buildings; Special Features; Line Construction, and Engineering and Maintenance. Volume III also contains a chapter on Electrical Measurements, by G. W. Patterson, and one on Storage Batteries, by F. B. Crocker and M. Arendt.

The fourth volume is devoted to telegraphy and wireless and contains also, a chapter describing the telautograph, and one describing the telegraphone. A general index is also included in Volume IV.

A feature that will appeal particularly to students is the questions appearing in each volume, which require a thorough understanding of the text to be answered.

"Wechselstrom-Arbeitsdiagramme." Ein Lehr- und Hilfsbuch für den Unterricht und für Selbststudium. By Emil Waltz. Berlin; Hermann Meusser. Cloth, 940 pages (6x9 inches), 255 illustrations. Supplied by the Electrical Review Publishing Company for $6.00.

The scope of this book is a good deal broader than is indicated by its title; it is not limited to the discussion of the diagrams useful in connection with alternating currents, but is a general treatise on the theory of alternating currents. While graphical methods receive first place under each topic, analytic methods are not neglected.

The first four chapters, occupying 170 pages, are devoted to vectors and operations with them, with special reference to rotating vector diagrams as used in alternating-current theory. While the discussion in these chapters is from the general mathematical point of view, numerous illustrations from applications of alternating currents are given. The next chapter (90 pages) is devoted to simple alternating-current circuits, and the following one (110 pages) to loci in the vector diagrams for such circuits. Then follows a chapter (140 pages) on circuits with mutual induction, after which come four chapters (240 pages) on stationary transformers, and one (80 pages) on induction motors.

The book is intended for those who are already familiar with the elements of alternating currents, but does not presuppose any very complete acquaintance with the subject. The style is very clear; and each topic is discussed with the greatest thoroughness and detail, so that the book is much easier to read than many technical works. This is an especially valuable feature in a book intended partly to meet the needs of private study. The rather large size of the book is due more to this thoroughness of elaboration than to inclusiveness of its subject matter. A large number of illustrative examples are included, and worked out in the book.

The author explains in the preface that this work is an outgrowth of a plan to make a translation of Cramp and Smith's "Vectors and Vector Diagrams Applied to the Alternating-Current Circuit." He has, however, far exceeded the limits of his original plan; and while he makes acknowledgment to Cramp and Smith's work, he has written quite independently of it, and has made a much larger book.

The typographical work is excellent, and the numerous diagrams are clearly printed, although many of them are very complicated in themselves.

J. R. BENTON.

Wireless Station Operated Without Ground.

The new Marconi wireless telegraph station at Fremantle, Australia, which has opened communication with Sydney across the continent of Australia, is operated without a ground connection in the ordinary sense. On account of the extreme dryness of the sandy soil at Fremantle a satisfactory ground connection could not be established readily. Accordingly, an insulated counterpoise is employed instead, constituting the lower element of the electrically vibrating circuit, of which the antenna is the upper element. The counterpoise consists of about 100 insulated wires radiating out from the antenna tower, and joined and supported by three concentric circles of wire. The web thus formed is supported on poles which are higher toward the center and lower at the outer edge, making a flattened cone-shaped network, which gives an open shape to the vibratory circuit, insuring satisfactory radiation, and an outward reflection of the waves from the counterpoise.

Engineers' Club Has Electric Kitchen.

The Engineers' Club of Boston has an electrical kitchen on the top floor. To meet the demand for clean and wholesome cooking, at the greatest ecenomy, the kitchen has been electrically equipped in every way. Electricity is used for baking, roasting, broiling, grilling, frying, and all other purposes, except for the warming ovens.

The kitchen range contains three large electric ovens, three electric frying kettles, a two-section broiler, a set of griddles and eight disk heaters. Each oven and utensil is controlled by a snap switch which gives any desired degree of heat.

New Electrical and Mechanical Appliances

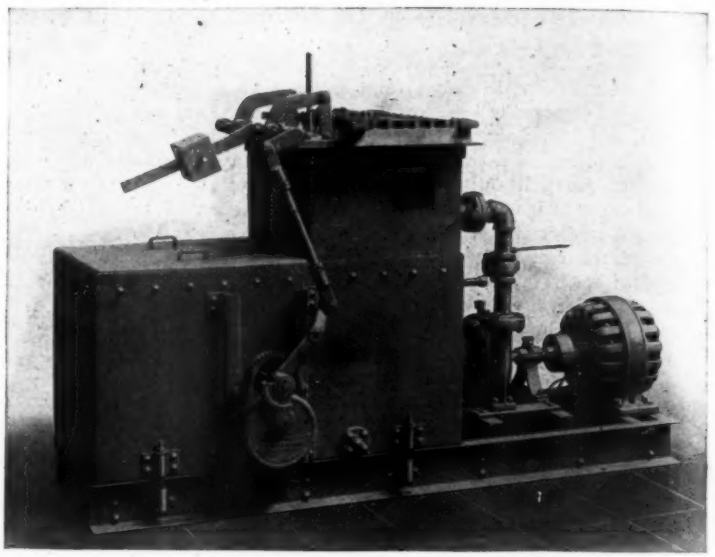
Liquid Rheostat for Large Alternating-Current Motors.

The use of large alternating-current slip-ring motors for driving mine hoists, winding gears, rolling mills, etc., has increased largely during the past few years and has created a demand for a simple, efficient and economical controller. To meet this demand the Westinghouse liquid rheostat has been developed.

These rheostats provide an infinite number of steps between the minimum and maximum limits, thus permitting fine speed adjustments and very smooth acceleration. The rate of acceleration can be definitely fixed and is independent of the rate at which the operator manipulates the starting lever; it is then impossible to injure the motor or the machine it drives by too rapid acceleration.

The entire apparatus is very simple in construction and very reliable in operation. There are but few parts susceptible to wear or deterioration and these can be easily and cheaply renewed.

The principle of operation of these rheostats is clearly shown by the accompanying diagram. The rheostat consists of two compartments, an upper tank for the electrodes, and a lower reservoir. The three phases of the rotor are connected to electrodes suspended in the upper tank. A small motor-driven pump pumps a steady stream of liquid, usually a solution of soda, from the reservoir into the electrode tank, and back into the the reservoir over the weir. Now by raising or lowering the weir, the height of the liquid in the electrode tank is correspondingly varied. The resistance in the rotor circuit decreases as the liquid level rises, and vice versa, and the motor speed of course, changes with the rotor resistance.



Liquid Rheostat for Large Slip-Ring Motors.

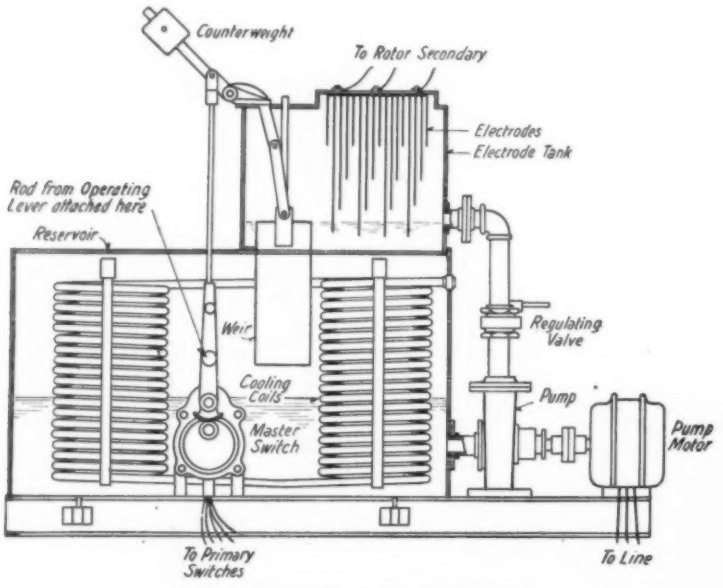
The primary circuit of the motor is closed and opened by means of electrically operated switches, which are controlled by a master switch mounted on the rheostat.

The operating lever of the rheostat controls both the master switch and the weir. When the lever is in its central or off position, the primary switches are opened and the weir is at its lowest level, so that the secondary resistance is maximum.

Speed control is secured by varying the position of the weir by moving the lever; the primary switches do not open until the lever is placed in the off position.

A valve in the intake pipe of the electrode tank regulates the rate at which the liquid is pumped in, so that no matter how quickly the operating lever is moved, the liquid can only rise at the rate for which the valve is adjusted, thus fixing the rate of acceleration. When the lever is returned to the off position, the weir drops and the liquid level promptly falls.

Cooling coils in the reservoir prevent rapid evaporation of the liquid. These rheostats are made in capacities of from 400 to 1,500 horsepower.



Sectional Diagram of Liquid Rheostat.

HIGH-VOLTAGE OIL-BREAK SWITCHES.

By E. H. Jacobs.

High-voltage switches may be divided into two classes, one in which the oil vessels are mounted in cells, and the other in which the cells or compartments are formed by the vessels themselves.

The best example of the high-voltage oil-break switch making use of isolating compartments to segregate the different

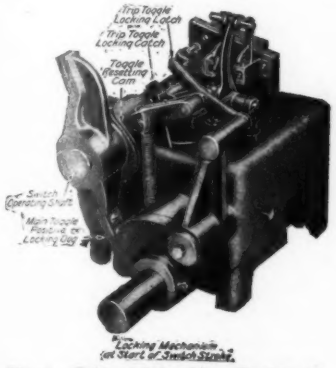

Trip Toggle Locking Latch
Trip Toggle Locking Catch
Toggle Resetting Cam
Switch Operating Shaft
Main Toggle Feed-in or Locking Dog
Locking Mechanism at Start of Switch Stroke.

Fig. 1.—Trip and Locking Device in Tripped Position.

phases is the widely used and well known motor-operated type. In this switch a small motor compresses one or more sets of compression springs for each movement, which, when released, throw the contacts to either the open or closed position. For example, when the opening springs are released, the switch contacts are thrown open in which position the operating arm rests against the closing springs and these latter then try to throw

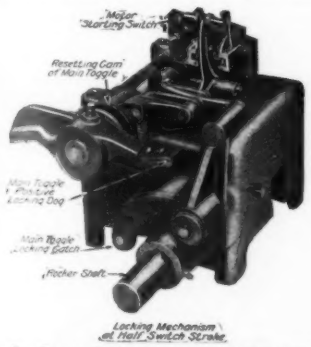

Motor Starting Switch
Resetting Cam of Main Toggle
Main Toggle Feed-in Locking Dog
Main Toggle Locking Catch
Rocker Shaft
Locking Mechanism at Half Switch Stroke.

Fig. 2.—Same Device Reset When Switch Has Moved Half Its Stroke.

the switch closed, but are prevented from doing so by two means, first by a clutch which allows the main shaft to turn only in one direction, and second by the motor, which by receiving current at the same time that the operating mechanism is released, takes up the motion of the mechanism just before the springs are encountered and completes the stroke.

The operating arms are connected to the main shaft, which always makes a half-revolution in the same direction at each stroke from a position slightly past center before the stroke commences to a similar position 180 degrees distant after a stroke is completed. This meaans that there must be some means of stopping the switch movement against the actuating force of compression springs after the completion of a stroke, or the switch mechanism would continue its movement and operate the switch in the direction opposite to the last movement. This makes it necessary to employ a lock which will release the operating mechanism when desired or on the occurrence of predetermined abnormal conditions against which it is to provide protection, and secure it against making more than one stroke.

In the motor-operated high-voltage switch this has always been done by mechanical lock. Since this feature of the switch has lately been considerably improved, a description of it will be given. Figs. 1 and 2 show the position of the locking mechanism at the beginning of and after the switch has half completed a stroke. Referring to Fig. 1, it is seen that the locking dog is fastened to the switch-operating shaft. Current has been thrown on the control magnet either by a manually operated control switch on the switchboard or automatically by relay. The plunger of the control magnet has lifted the trip toggle-locking latch, the trip toggle catch and moved the main toggle-locking catch (Fig. 2) away from the locking dog, which allows the switch to operate. The rising of the magnet plunger has also closed the motor-starting switch (Fig. 2) so that the motor has received current at the same instant. Fig. 2 shows the locking mechanism after the switch has completed a half stroke and the main operating shaft and locking dog have moved 90 degrees. It is seen that the trip toggle latch and catch, as well as the main toggle catch, have returned to the locking position. Consequently, after the main shaft has traveled 180 degrees, the locking dog will have reached the locking catch and arrested the motion of the switch, thus insuring but one complete stroke. To accomplish this a number of safeguards are introduced. On the rocker shaft, which rocks back and forth a short distance

Fig. 3.—Contact Brushes for Over 300 Amperes (Form H3 Switch).

each time the switch operates, a cam and rod (not shown in the illustration) mechanically forces the magnet plunger back to the normal position, thus obviating any difficulty which might result from the residual magnetism in the control magnet preventing the plunger from dropping back by its own weight. Another means of bringing the locking dog back to the locking position is the tension spring shown in Figs. 1 and 2. A third

Fig. 4.—Contact Brushes for Currents of 2,000 Amperes (Form H6 Switch).

means is the toggle-resetting cam, which by working through the toggle shown mechanically forces the locking latch back. The first and third means are positive in their action and insure the locking catch being returned to the normal position in sufficient time to catch the dog.

Another interesting feature is that the locking dog does not come against the catch with any considerable force, as the construction of the switch is such that the compression springs tend to retard the motion of the switch after the stroke is nearly completed, and power from the motor is necessary to move the operating mechanism and locking dog slightly over center, where it moves against the locking latch without shock and is held in the locked position.

For motor-operated switches up to 300 amperes but one set of contacts is used, which consists of brass rods that make and break contact with the inner surface of segments of a cylinder under oil. For 500 amperes and upward it has been the custom to make use of another set of contacts for each phase similar to a circuit-breaker brush, and bridging across the tops of the oil vessels to carry the load current. For currents above 2,000 amperes, and occasionally below this figure, a new style contact is used which is similar to the well known sliding wedge type, as shown in Fig. 4. This arrangement has been used on switches with normal rating up to 4,000 amperes. These switches are also now built with the oil vessels in a continuous row, Fig. 6 whereas heretofore they were always furnished with the pots in parallel, Fig. 5. They are al o now built in bottom, back, and combination back and bottom-connected, which makes them suitable for all kinds of station arrangements.

A type of high-voltage switch developed within the last year or so has rapidly become popular. It consists of separate and self-contained elements. The exterior consists of completely inclosing steel tanks, while the interior consists of movable and stationary contacts. The stationary contacts are widely flared fingers, and the movable contacts consist of wedge-shaped blades fastened directly to the operating mechanism by a wooden rod. This type of switch can be operated by hand, by a direct-current solenoid, or by compressed air. On all non-automatic mechanisms, provision is made for easily adding automatic overload protection at any time.

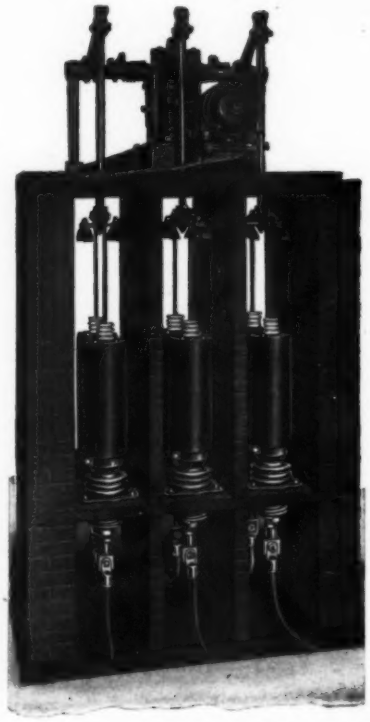


Fig. 5.—Form H3 Oil Switch With Special Cell.

The most recent development in high-voltage oil switches is the outdoor switch. As shown in Fig. 7, this is practically similar to the foregoing, except that the portions exterior to the covers are arranged so as not to suffer from exposure to the weather. The exterior portions of the bushings are of the petticoat style. The exterior mechanism is inclosed in weatherproof cases, as shown. The switches are either hand or solenoid-operated. For automatic tripping on overload, bushings type transformers surrounding the switch studs and inside the switch cover are generally used.

The switches described in this article are manufactured by the General Electric Company, Schenectady, N. Y.

Lighting the Largest Bascule Bridge in the World.

The lighting of what is said to be the largest bascule type of bridge in the world, the one that crosses the Williamette River at Portland, Ore., consists of 7,000 lamps arranged in an outline decorative system, together with 250 five-light and two-light pole fixtures. The lamps in the outline scheme are 32-candlepower carbons, spaced 18 inches apart, while the pole fixtures contain 100-watt tungstens. The energy for supplying all this lighting is brought to the lamps through more than 12 miles of Simplex Wire & Cable Company's Code wire, all of which is installed in metal conduit. The outline system will be used more for decorative purposes and special occasions than for regular lighting, hence the choice of carbon lamps.

The bridge itself, which is 4,800 feet long, connecting Broadway Street on the west side with Broadway on the east side of the river, provides an easy-grade thoroughfare from the

Fig. 6.—Single-Throw, 15,000-Volt, 2,000-Ampere Oil Swtich.

Fig. 7.—Single-Throw, 70,000-Volt, Outdoor-Type Oil Switch.

business district to the large residential district on the west side. This bridge was built by the city at a cost of $1,300,000.

A New Mine Rescue Telephone Equipment.

The problem of devising ways and means for the protection of human life in mines is probably the most important question before mine operators and the United States Bureau of Mines today. The laws of practically every state in which mining operations are carried on call for regular inspections and also contain many safety regulations, not the least of which, in a number of the states, is a section making compulsory the use of telephones underground.

During the past few years, the Western Electric Company has furnished several thousand mine telephones for underground use. Through its intimate association with those interested in mine safety work, attention was directed to the urgent need for some means of instant and continuous communication between an advance, or rescue, party equipped with its oxygen apparatus and the rear party outside the mine. In the past, members of rescue parties have lost their lives where loss of life could have been prevented by a quick and reliable means for summoning aid.

The demand for this type of equipment has been met by the Western Electric Company which has succeeded in producing a light, serviceable and extremely simple telephone equipment for use in rescue work. In developing the apparatus the Bureau of Mines was frequently consulted in order that every requirement of this very severe service might be fully covered.

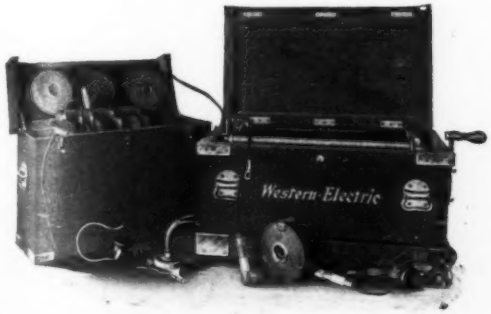
A man wearing an oxygen helmet, which covers his mouth, cannot use the ordinary type of telephone transmitter, so that a special type of transmitter, known as the "throat" transmitter, had been developed to meet this unusual condition. The transmitter is very light and compact and is provided with a soft rubber cup to adapt itself to the curve of the throat. This throat transmitter has been found by actual test to transmit speech practically as well as the standard instruments. Both receiver and transmitter are held firmly in position in such a manner that they will not interfere with any type of oxygen apparatus now on the market. The telephone equipment used by the men at the outside or directing end is a standard switchboard operator's set consisting of a chest-type transmitter and headband receiver.

Mine Rescue Telephone Equipment.

The rescue party is connected with the rear by means of a small wire cable consisting of two copper conductors insulated with black enamel and two servings of silk, all of which is covered with a stout linen braid impregnated with moisture-resisting compound. This wire is in 500-foot coils and is carried in a leather case fastened to the helmet man's belt, paying out as he advances. As the coils are very light, weighing less than three pounds apiece, several of them can easily be carried and as one is run out, another can be connected by means of a plug and jack combination. The wire is so wound that it cannot become tangled and will pay out in whatever position the helmet man may have to assume. The total weight of telephone equipment carried by the helmet man, including one coil of wire, is only a little over five pounds.

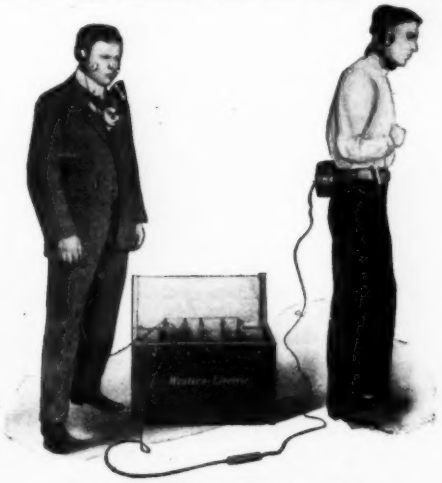
One end of the coil is equipped with an aluminum-incased plug which connects with the head receiver and throat transmitter by means of a similarly incased jack. The other end is equipped with a similar jack connecting with a plug and cord running to a battery and apparatus box. This box is an essential part of the equipment and must be located at the point from which the rescue party is being directed. It contains eight dry batteries mounted in a Patterson screw-type battery holder, also a key, two jacks and a battery gauge mounted in a removable compartment. The operator's telephone set is connected to the apparatus and battery box by means of a cord, plug and jack. The key operates in two directions and has three positions: neutral, right and left. In the neutral position the batteries are in circuit; when operated one way the batteries are disconnected to save current when the apparatus is not in use; while in the other position the battery gauge is connected across the battery terminals so that the condition of the batteries can be determined. It would be a serious matter to discover that the batteries were too weak for service after the rescue party had entered the mine.

In many cases it may be found desirable to use cable for carrying the talking circuit down a shaft or into a slope up to the edge of the danger zone. For this purpose a large box, including a cable reel, is furnished. The box is a heavily reinforced, metal-cornered box made of ash and containing an aluminum reel holding 1,300 feet of specially strong and flexible



Rescue Telephone Equipment with Cable and Reel Box.

Throat Transmitter and Head Receiver.



Rescue Telephone Equipment in Use.

twisted-pair cable, having a 30-per-cent pure Para rubber insulation of the highest grade obtainable. A heavy ratchet and pawl are provided to prevent the reel from turning after enough cable has been paid out. Connections with the apparatus box and the coil carried by the helmet man are effected by means of aluminum-incased jacks and plugs, while electrical contact with the inside end of the reeled cable is made through collector rings and commutator brushes connected to a jack.

The entire outfit has been designed and constructed with a view to providing practical and serviceable telephone equipment for mine rescue work. Service tests have proven that this object has been attained and the telephone equipment should be of great benefit to those engaged in rescue work.

Special Telegraph Insulators for a Salty Region.

Some years ago the Postal Telegraph-Cable Company extended lines from Wendover, Utah, through a peculiar stretch of ground which in wet season is covered with a salty mud but in dry season becomes very dusty.

The insulators used were the standard Brookfield design which was made especially for and has proven very satisfactory on the Postal Company's lines, but in this particular locality some trouble from short-circuiting developed after the melting of a heavy snow.

Careful investigation showed that during the dusty season enough salty dust had collected upon the insulators to form a thin coating, which when later mixed with the melting snow had formed a salt solution of high conductivity. It was found that the dust coating was easily parted from the glass insulator surface but the shape of the insulator rendered some of the surface inaccessible.

Recent tests made on insulators by J. H. Skirrow, engineer of the Postal Company, have resulted in the adoption in the affected locality of a new type of Brookfield insulator. This new design has, first, a large and comparatively flat surface which can be cleaned conveniently; second, two large protected interior areas, and third, a very deep inner petticoat which makes an extremely long path for the current from any point to the pin. These new insulators are being manufactured by the Brookfield Glass Company, of New York.

Veluria and Calla Glass Bowls for Semi-Indirect Lighting.

One of the most marked tendencies in the lighting field in recent years has been the rapidly growing popularity of semi-indirect lighting. This has been based on the widely held belief that it incorporates to a large degree the advantages of both direct and pure indirect lighting. Among manufacturers who have seen this tendency and provided for it is the Holophone Works of the General Electric Company, Cleveland, O., which has added to its steadily broadening lines of illuminating glassware a set of very attractive designs of semi-indirect bowls, two of these being shown herewith.

Fig. 1.—Veluria Semi-Indirect Bowl.

The design in Fig. 1 is made in Veluria glass, a pure velvet-like opal of relatively light density. This type of bowl is made in three sizes, 12-inch, 16-inch and 20-inch outside diameters; the corresponding depths of these bowls are 6.375, 8.625 and 10.75 inches. When so specified the bowls can be furnished with a hole in the center of the bottom in which to secure a metal socket-holding knob that will hold the lamp upright in the center of the bowl, since a single large lamp is best adapted for this shape of bowl.

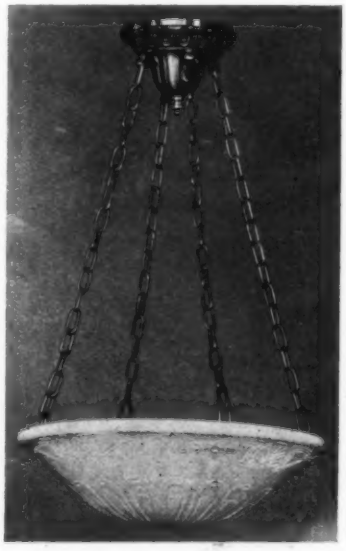


Fig. 2.—Calla Semi-Indirect Bowl.

The new Calla glass is used in the design shown in Fig. 2. This is a snow-white opal of considerably greater density than Veluria glass. It has a soft outer surface of great beauty, giving the impression of being absorbent; the inner surface has a cold brilliant polish and high reflecting power. The design is simple and delicate, standing out in low relief as do the designs of a brocade, thus producing an unusual and very artistic effect. This type of bowl is made in 16 and 20-inch sizes with a depth of 5 and 6.25 inches.

Both these designs, which are typical of the new Holophane line of bowls, are suitable for all places where an ornamental lighting effect with the high diffusion of pure indirect lighting must be obtained together with the richness and warm glow characteristic of opal glassware.

Electric-Furnace Method for Eliminating Chance in Hardening Tools.

To properly harden the hundreds of thousands of tools and dies used or manufactured in the mammoth plants of the present day requires scientific methods and reliable apparatus. Too much is at stake to permit the use of methods which are uncertain in their results and perhaps dependent on the personal equation.

Of the different types of hardening furnaces, the electric furnace possesses two great advantages, uniformity of heating and ease and exactness of heat control, which make it possible to determine when the steel has attained the right temperature by the temperature of the bath.

In the electric furnace shown in the illustrations the crucible or container for the bath is lined with large special fire-brick slabs, fitted and cemented together so as to prevent any possibility of leakage of the bath. The dimensions of the crucible are 8 by 8 by 12 inches deep, although the bath is only 8 inches deep. The lining is surrounded by heat-insulating material and the whole contained in a substantial sheet-iron case.

Two iron electrodes located on opposite sides of the crucible are of sufficient area so that the current flows

through practically every part of the bath, insuring absolute uniformity of temperature throughout the whole bath.

A regulating transformer is provided for varying the potential impressed on the bath and consequently the temperature of the bath. The secondary coils of this transformer are direct-connected to the furnace electrodes, while the primary coils are subdivided into a number of sections, taps from the latter being brought out to a dial switch provided with 11 points and a reverser. By turning the dial through two revolutions a total of 21 adjustments can be made with corresponding range of voltage applied to the furnace electrodes, varying from that necessary to keep the bath just above the freezing point to that required to start the furnace. The dial-switch contacts are of sufficient size to prevent possibility of injury from burning.

A line panel provided with ammeter, line switch and fuses is furnished with each transformer. The dial switch and line panel are installed in a metal framework mounted on the top of the transformer case.

The hood for the furnace contains a warming oven. Some gas is given off in starting the furnace, yet during normal operation this is inappreciable.

The kind of bath used in this type of furnace depends upon the temperature at which it is to be operated.

For hardening carbon steel, in which the temperature required varies from 750 to 1,000 degrees centigrade, a mixture of barium chloride and potassium chloride is used, the proportions varying with the temperature. For hardening high-speed steel, where temperatures up to 1,300 degrees centigrade are required, barium chloride only should be used.

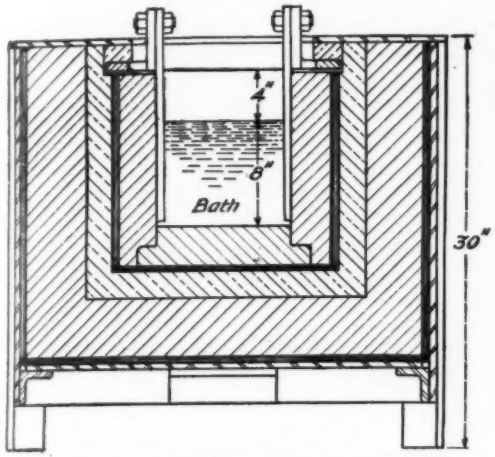


Fig. 1.—Sectional Elevation of Hardening Furnace.

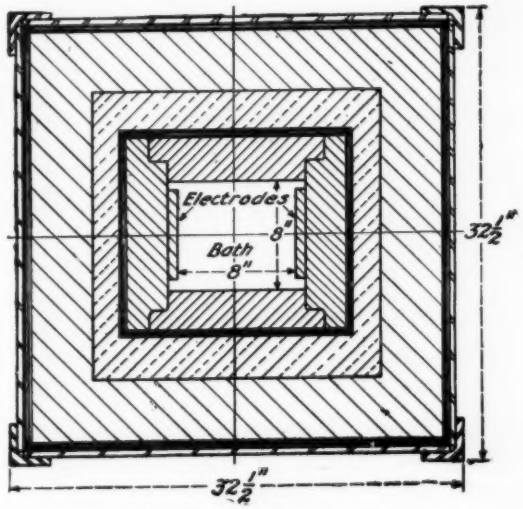


Fig. 2.—Sectional Plan of Furnace.

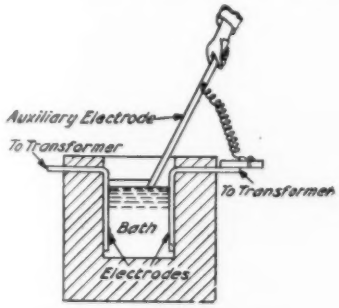


Fig. 3.—Starting the Furnace.

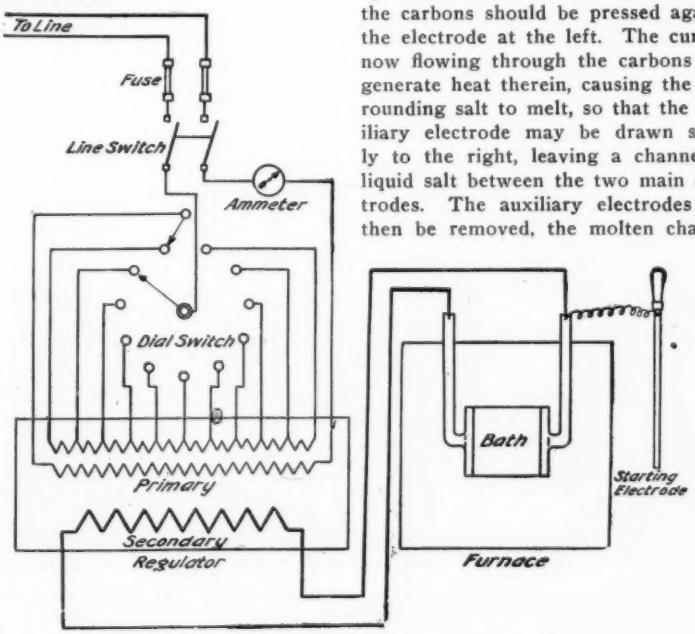


Fig. 4.—Diagram of Furnace and Control Circuits.

Salts used for the bath are non-conductors of current when cold, and it is necessary, therefore, to start the melting of the bath by means of the auxiliary electrode provided for the purpose. Unless started with fresh salts, a channel of about two square inches section should be cut in the solidified bath and to extend from one electrode to the other, the chips remaining in the channel. The electrodes should be cleaned for contact at the ends of the channel, and two or three pieces of any standard lamp carbon approximately 7 inches long should be laid on top of the chipped portion. With the dial switch about one turn from either limit, the line switch should be closed, and by means of the auxiliary electrode the carbons should be pressed against the electrode at the left. The current now flowing through the carbons will generate heat therein, causing the surrounding salt to melt, so that the auxiliary electrode may be drawn slowly to the right, leaving a channel of liquid salt between the two main electrodes. The auxiliary electrodes can then be removed, the molten channel together with the carbons being sufficient to maintain the circuit, which will gradually increase the molten bath until the entire mass is in a liquid state, after which the starting carbons are removed.

The melting process can be shortened by using higher voltage, obtained by rotating the dial switch, the extreme limit for counter-clockwise rotation corresponding to the highest voltage.

As the melting of the bath progresses, its resistance decreases and, to prevent an excess current being taken, the voltage should be lowered by rotating the dial switch so as to keep the line current within normal or below the scale of the ammeter.

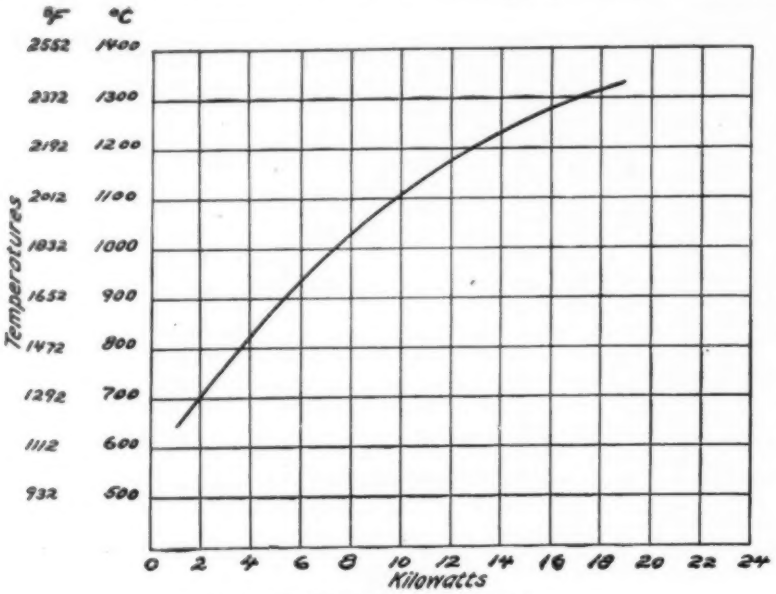


Fig. 5.—Power Required by Furnace.

About ten minutes is required to establish the molten channel between the two electrodes and the entire bath reaches its working temperature in about 1.5 hours. Any further adjustments in temperature can then be quickly obtained by changing the voltage.

The temperature of the bath can be quickly and accurately determined by a pyrometer with a thermocouple inclosed in a steel tube so as to give it maximum life. With the scale of the milivoltmeter calibrated in degrees the exact temperature is readily obtained.

When a tool is placed in the bath, a crust of solidified salt forms on it, which being a poor conductor of heat and melting slowly, prevents too sudden heating. Preheating is advantageous, especially in the case of large tools.

When the tool has attained the temperature of the bath, it is removed, a thin film of the salt adhering to it and preventing oxidation. This salt chips off when the tool strikes the cooling medium, leaving a clean surface.

The equipment shown in Fig. 6 is installed in a blacksmith shop for hardening high-speed steel; about 65,000 tools are handled per year. The tools are first placed in the preheater (shown at the right of the illustration), which latter is oil-fired, the air blast having a pressure of 8 ounces. The shelf on the front of the preheater is used as a receptacle for the tools which are to be hardened and so saves many steps. The tools are placed so that their cutting ends project over the burners. When heated red-hot the attendant removes the tools and places them in the furnace, at the same time pressing the button of the clock device, shown to the right of the furnace, turning on the lamp. At the end of the period for which the timing device is set, the lamp goes out, notifying the attendant to remove the tools. The proper period is determined by testing to determine when the tool has reached the temperature of the bath. The tools are quenched in the oil bath shown to the left, which is agitated by air to keep it cool.

An air blast is also provided for cooling and is shown just in front of the pyrometer.

The electric furnaces described above are manufactured by the General Electric Company, Schenectady, N. Y.

Fig. 6.—25-Kilovolt-Ampere Furnace for Hardening High-Speed Steel.

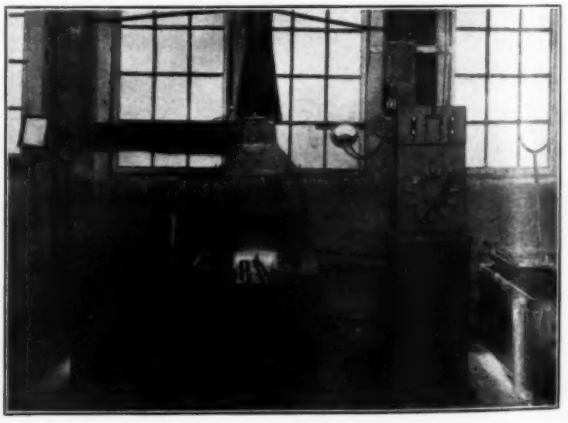


Fig. 7.—12.5-Kilovolt-Ampere Furnace for Hardening Carbon Steel.

Municipal Electric Plant Operated from Waste Heat.

A report from an American consul in Newcastle, England, states that the town of West Hartlepool, England, which claims to be the first municipality to produce electricity by means of waste heat, is about to open its new generating station. The two turbo-generators, each of 1,500 kilowatts, will be driven by exhaust steam from the furnace-blowing engines of the Seaton Carew Iron Company, adjacent to whose works the station is built. In return for this exhaust steam, which has hitherto been blowing to waste in the air, the Seaton Carew Iron Company will receive free from the municipal corporation the supply of electric current it needs at the works.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

HANCOCK, WIS.—Electric lights are to be installed in this city. C.

SIDNEY, NEB.—Electric light bonds to the amount of $22,000 have been carried. C.

BELLVUE, IOWA.—Plans are under way for the installation of a boulevard lighting system. C.

SCOTT, GA.—J. T. Burke, of this city, is planning to establish an electric light plant here.

PIPESTONE, MINN.—Pipestone's main business street will be converted into a "White Way." C.

BELFIELD, N. D.—The proposition of an electric lighting system for this place is being agitated. C.

SENECA, MO.—H. H. Mace, of Mountain Grove, is planning to install an electric light plant here.

DE PERE, WIS.—The Council has adopted a new street-lighting system providing for 200 tungsten lamps. C.

SIDNEY, NEB.—$22,000 will be expended for an electric light and heating plant. Address the city clerk.

GLENDALE, CAL.—It has been voted to form a lighting district of Casa Verdugo and North Glendale.

COOK, NEB.—The Council is planning to install a $20,000 light and water system. Address the city clerk.

WATERLOO, IOWA.—Another generator will be installed in the electric light plant, which will cost approximately $3,500. C.

HANCOCK, WIS.—A franchise has been granted to R. H. White for the installation of an electric light plant here.

WEST VIEW, PA.—H. L. Donaldson, clerk, West View, Pa., will receive proposals, until July 1, for lighting the borough.

MONONA, IOWA.—F. L. Wellman & Son, have been granted a 25-year franchise to establish an electric lighting system. C.

MONTEVIDEO, MINN.—The Montevideo Electric Light & Power Company, has been incorporated for a period of 20 years. C.

THREE RIVERS, MICH.—The Council is planning to build a $50,000 light and water system. Address the city clerk.

BASTROP, LA.—The city is planning to enlarge electric light plant. Address J. K. Skipworth, mayor, for particulars.

JONESVILLE, S. C.—$22,000 will be expended for the construction of a municipal electric lighting plant. Address the city clerk.

LOUISVILLE, KY.—Motors will be needed by the A. L. Kaercher Furniture Company, this city, in the equipping of its factory. G.

PHILADELPHIA, PA.—Chief Pike, of the Electrical Bureau, plans to construct underground wires at the rate of 10 miles per year.

CENTERVILLE, IND.—A committee has been appointed to consider ways and means to secure arc lights. Address the city clerk.

ERIE, ILL.—The Village Board has granted a 25-year franchise to the Rock River Light & Power Company, to sell light and power in Erie. Z.

CARO, MICH.—W. W. Peck of St. Johns, has been directed by the Council to prepare estimates for installing boulevard street lighting.

SABULA, IOWA.—J. J. Maher, his heirs, and assigns, were granted a franchise to erect, maintain and operate an electric light plant in this city. C.

NICETOWN, PA.—Plans are being prepared for the construction of a power plant here for the G. W. Blabon Company to cost $20,000.

FORT WORTH, TEX.—The Fort Worth Power & Light Company will double the capacity of the powerhouse on Trinity River at Main Street.

ROCKY MOUNT, N. C.—$135,000 will be expended for the erection of an electric light plant. Address W. L. Parrott, mayor, for information.

BLUFFTON, IND.—The Public Utility Commission has authorized the city of Bluffton to issue $20,000 electric improvement bonds. Address city clerk.

JACKSONVILLE, ILL.—The city clerk has been authorized to advertise for bids for a 200-kilowatt three-phase sixty-cycle 2,300-volt generator with revolving field. Z.

GRASSTON, MINN.—Eastern Minnesota Power Company, has been granted right to erect and maintain poles, masts, wire and other fixtures in this village for 25 years. C.

GAINESVILLE, Mo.—The Missouri Gas & Electric Company is planning to construct three miles of transmission lines. Address L. J. Beauregard, chief clerk.

HOLSTEIN, IOWA.—The Holstein Service Company, organized with capital of $25,000, plans to build an electric light plant. Alfred Haas, clerk, should be addressed for information. C.

ROCKPORT, TEX.—The Rockport Electric Light Company has sold its electric light and power plant to G. E. Fussell, of Eagle Lake. Mr. Fussell will remodel and enlarge the plant. D.

CALDWELL, N. J.—The Board of County Freeholders has granted the Public Service Electric Company permission to erect poles and install a system on Bloomfield Avenue, Caldwell. A.

BATTLE CREEK, MICH.—Residents in Orchard Avenue have asked to have that street paved and all wires placed in conduits. Address the city clerk for further information.

AURORA, MINN.—The Northern Minnesota Power Company expects soon to commence work on its water-power plant to furnish electricity to Aurora and other nearby places.

ANN ARBOR, MICH.—For the purpose of improving Ann Arbor's lighting service a special committee has been appointed by the Civic Association, of which A. E. Green is chairman.

LITCHFIELD, MICH.—The proposition to issue $7,500 electric light bonds will be submitted to the vote of the people. Address the village clerk for particulars pertaining thereto.

WILMINGTON, DEL.—The Imperial Hydro-Electric Corporation has been incorporated with a capital stock of $1,500,000. Herbert E. Latter, this city, is named as the principal incorporator.

BAKER, ORE.—Commissioner Findley of the City Council has been authorized to employ a competent engineer to prepare plans and specifications for a municipal lighting plant which will cost $25,000. O.

HIGHTSTOWN, N. J.—The Electric Light & Power Company of Hightstown will install a new tungsten street-lighting system here; the borough has entered into contract with the company for the improvement. A.

HATTIESBURG, MISS.—We are informed by the Hattiesburg Traction Company that the installation of ornamental street lighting is not contemplated, as was erroneously stated in our issue of June 7.

NASHVILLE, TENN.—This city has sold bonds to the amount of $100,000, the money to be used in extending the electric light system. The Board of Public Works is in charge of the improvements. G.

CENTRALIA, WASH.—The local water plant was recently turned over to this city by the Washington-Oregon Corporation and as soon as the litigation over the intake on the Newaukum River is settled work on a municipal gravity-water system will begin. O.

PADUCAH, KY.—The City Council is considering the appropriation of $9,000 for the purchase of equipment for a new pumping station. The pumps will be motor-driven. L. A. Washington is city engineer. G.

LEXINGTON, KY.—The Transylvania University will erect a central lighting and heating plant for the service of all of its buildings. The amount appropriated for the work is $40,000. R. H. Crossfield is president. G.

LOUISVILLE, KY.—The Realty Investment Company, which is erecting a $250,000 apartment house in this city, will build an electric light plant which will serve the apartment building and other structures in the immediate vicinity. G.

PEARL CITY, ILL.—G. W. Benfer, of Lena, president of the Electric Light

& Power Company, has been granted a franchise for supplying light and power for this city. A feed wire will be run here from Lena as soon as the necessary right of way has been secured.

SCANDIA, KANS.—Scandia has completed arrangements with the Concordia Electric Light Company for the installation of a lighting system. The City Council passed their approval on the proposition which will also be taken up by the citizens of Kackley in the near future.

SOUTH VANCOUVER, B. C.—The Fire, Water and Light Committee of the City Council recently instructed L. F. Rawden, municipal electrician, to prepare a report on the cost of providing an electric plant for supplying incandescent lighting for householders and power for manufacturers. O.

LEWISTOWN, MONT.—Lewistown Gas & Light Company will rebuild its system in this city during the summer. The rebuilding of the flume leading from the headquarters of Spring Creek to the big power plant, and improvements to the local distribution system are included, work will cost about $25,000. O.

YARDVILLE, N. J.—Charles A. Comp of this place has acquired the Yardville Electric Lighting Plant, located between Yardville and Groveville, and furnishing service to both communities; as well as the flour milling plant operated in connection. The new owner plans for extensive improvements to both properties. A.

TRENTON, N. J.—The Public Service Corporation has acquired property on the Delaware River, near Burlington, and plans for the erection of an extensive electric power plant to replace many of its smaller stations in this district. The proposed plant will furnish electric energy for light, power and railway service.

WHITE, S. D.—Bids will be received by R. E. Cameron, auditor, until June 30, for the purchase of $5,000 of White City 20-year bonds, with 5-per-cent interest, payable semi-annually; for purpose of constructing, maintaining and operating a municipal electric light plant. A check for 3 per cent must accompany bids. C.

AMITY, ORE.—Lewis C. Kelsey, consulting and hydraulic engineer, Portland, is preparing plans for a complete water system to be constructed here. The plant will consist of a pumping station and distributing system, and will cost $25,000. Bids for construction will be called for after the sale of bonds has been negotiated. O.

SEQUIN, TEX.—The Guadalupe Waterpower Company expects soon to complete the engineering work for developing water power on the Guadalupe River and constructing 250 miles of interurban system. It is stated that this company will organize the Central Texas Traction Company to build the railway.

BURBANK, CAL.—At an election held in this city recently the residents voted bonds to the amount of $20,000, the money derived therefrom to be used in the establishing of a municipal electrical system. Further particulars may be secured by addressing any member of the Electric Lighting Committee, Messrs. Klein, Paxon or Craig.

HURON, CAL.—Farmers near this town and others near Turk are taking steps toward the organization of a company which will bond itself for $200,000 and establish a lighting and power plant, at an estimated cost of $180,000, to be in operation by the first of March, 1914. E. E. Goodings is at the head of the movement.

LOS ANGELES, CAL.—An ordinance has just been passed by the City Council of this place providing for extension of the ornamental lighting system on Hill Street. The city will pay $320 as its share of the cost of the improvement, which is one-eighth of the cost of the first year's lighting. A similar ordinance will soon be presented providing for the lighting of Ninth Street.

GLENDALE, CAL.—By a substantial vote the residents of North Glendale and Casa Verdugo have voiced their desire to become an electric-lighting district. It is understood that just as soon as the necessary steps can be taken bids will be received for the necessary apparatus and the system installed, the work to be done by and under the personal supervision of the supervisors of Los Angeles County.

LOS ANGELES, CAL.—Announcement has just been made public here that the San Joaquin Light & Power Company will expend $2,000,000 this year in extending its lines and otherwise improving its system. The plans include two new hydroelectric plants, the San Joaquin River plant, which will generate 3,000 kilowatts, and the Tule River plant, which will increase the power capacity 6,000 kilowatts, the rebuilding of the Kern River canyon plant and the placing of a new unit in the Bakersfield stream plant that will generate about 6,250 kilowatts. It is the intention of the company to rebuild much of the Bakersfield plant and to add many features that will facilitate its management. It is also stated that there will be erected a network of power and distributing lines throughout the Valley regions and part of the Coast district. There will be four principal substations, from which the secondary lines will feed, these being located at Caolinga, San Miguel, San Luis Obispo and Santa Marie.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

FARGO, N. D.—The Overland Telephone Company has been incorporated with a capital stock of $8,000 and will build 115 miles of line.

DALLAS, TEX.—The Southwestern Telegraph & Telephone Company has been granted permission to lay conduits in Carroll Avenue and in Junius Street.

ALTURAS, CAL.—The Dent Telephone & Telegraph Company has applied for a franchise in Modoc County. Bids will be received for the same until July 21.

MITCHELL, S. D.—At a special election held here bonds to the amount of $60,000 were voted for the erection of a municipal telephone plant. Address the city clerk.

McCONNELLSVILLE, O.—Young Hickory Telephone Company has been incorporated with a capital stock of $15,000 by James F. Leeper, Clyde Leeper, Frank H. Smith, Anna B. Smith and Converse Weeden.

HAMMONTON, N. J.—The Board of Public Utility Commissioners has approved of an ordinance granting the Delaware & Atlantic Telegraph & Telephone Company permission to install and operate a system throughout Mullica Township.

MARSHFIELD, WIS.—The Marshfield Rural Telephone Company has filed articles of incorporation, with a capitalization of $5,000. The incorporators are J. C. Marsh, Harry Hambright, Anton Siegert, John Kestel, and others. It is the intention of the company to build a telephone line from this place to Rozellville, establish an exchange in that town and radiate lines out from that point from time to time.

JEFFERSONVILLE, IND.—The Home Telephone Company is preparing to establish a plant in this city, having received a franchise from the municipality. The company has been incorporated with $10,000 capital stock.

JERSEY CITY, N. J.—The New York Telephone Company has entered into agreement with the Monticello Avenue Business Men's Association to install an underground conduit system on Monticello Avenue, to replace its present overhead lines. A.

MALDEN, WASH.—E. E. Segel, this city, recently purchased the Malden Supply & Power Company, and the local telephone system. The new owner will improve the plant at once, making it one of the best in this section of the country. O.

SHELBYVILLE, ILL.—The New Western Telephone Company has been incorporated with a capital stock of $1,050 for the purpose of establishing a telephone exchange here. The incorporators are C. E. Robinson, B. F. Bowman and G. L. Forsyth.

LIBBY, MONT.—Supervisor W. A. Raymond of the Kootenai National Forest is making arrangements to install a temporary telephone line between Libby and Troy, Mont., a distance of 18 miles. A permanent line will be put in later by the Libby Telephone Company. The line will be a great help in forest administration, as well as furnishing a means of quick communication for the people of the two towns.

GARFIELD, WASH.—The Inland-Independent Telephone Company has been granted a franchise by the City Council for right of way through this city. The company will begin construction work at once upon a line which will have for its initial point the city of Spokane, and the city of Pullman for its terminus. Eventually the company proposes extending the line to Lewiston, Idaho, and possibly to the southern part of Idaho.

SENATOBIA, MISS.—The Cumberland Telephone Company will rebuild its entire system. Address G. C. Simmons, who is in charge of the matter.

CHICAGO, ILL.—Announcement has been made by the Chicago Telephone Company of plans for the establishment of a new $400,000 telephone exchange in the downtown district. The new exchange will take care of the service now given over Harrison lines and will be completed May 20, 1915.

VANCOUVER, WASH.—The Southwestern Washington Telephone Company has been granted a franchise by the Clarke County Commissioners to construct and operate a telephone system in the county. A contract was also entered into to string telephone lines from Crusher to Yacolt. The telephone company will also establish a service from Yacolt to Lucia, to Hession, to Manor, and to Battle Ground. The present Manor Telephone Company will be taken over.

ELECTRIC RAILWAYS.

(Special Correspondence.)

BIWABIK, MINN.—Plans are being made for extension of Mesaba Electric railway to this village. C.

RICHMOND, VA.—The Virginia Railway & Power Company has obtained a franchise to extend the lines of the company.

PLAINFIELD, N. J.—The Board of Trade is interested in an extension of the local trolley system to South Plainfield and New Market.

KANSAS CITY, MO.—The Metropolitan Street Railway Company is to establish a short line from the business section of the Kansas side to Argentine.

LOS ANGELES, CAL.—Officials of the Pacific Electric Railway Company have announced that more than $300,000 has been set aside by that company for improvements in Pasadena.

OSHKOSH, WIS.—The Wisconsin Electric Railway Company plans to rebuild its Oshkosh-Neenah interurban line so as to take in the Northern Hospital. C.

RAYMOND, WASH.—The Willipa Harbor Railway Company announces the extension of its line from this city to Menlo, at once. Ray Fulcher will be the engineer in charge of the work. O.

SPRINGFIELD, ILL.—The Capital City Park & Amusement Company, which operates the Zoo Park, announces that a separate company will be organized to run a street railway to the park. Z.

RICHMOND, VA.—An electric traction line is proposed from Lancaster to Richmond. L. B. Herrington, of the Dix River Power Company, is said to have information regarding the project. G.

PADUCAH, KY.—The Kentucky Southwestern Electric Railway & Light Company is preparing to let a contract for the construction of a traction line from this city to Murray, a distance of 55 miles. G.

BUFFALO, N. Y.—C. D. Mead is working on the promotion of an interurban line to connect Buffalo and Jamestown and states that he intends to push the work forward as rapidly as possible.

HONESDALE, PA.—The Wayne County Railway Company has been incorporated to construct and operate an electric line 15 miles long. The capital is $100,000. Martin B. Allen, of Honesdale, is president. N.

SIOUX CITY, IOWA.—The Baker Construction Company, plans the construction of an interurban line between Sioux City and Omaha, and is constructing a big power dam in the Niobrara River, at Niobrara, Neb. C.

EUGENE, ORE.—The Portland, Eugene, & Eastern Electric Railway proposes rebuilding the College Crest loop of the local street railway system as soon as the Eugene Monroe Interurban line is connected up with the local system. O.

ASTORIA, ORE.—The Pacific Power & Light Company has announced that it will co-operate with the City Council in the extension of the street-car line from Forty-Fifth Street to a point near the Hammond Mill. In all likelihood, the line will be extended during the summer.

ALLIANCE, O.—The Stark Electric Company has secured right of way from Alliance as far as Marlboro for a line which the company intends to build from this city to Akron, probably passing by Congress Lake and reports are current that construction work will be started this fall.

PORT MOODY, B. C.—British Columbia Electric Railway has plans under way for the construction of a tramway line between this city and New Westminster. It is reported that work of construction will start as soon as the final revised plans have been submitted by the engineer in charge of the work.

SALEM, ORE.—Robert E. Strahorn, president of the Portland, Eugene & Eastern Electric Railway, is authority for the statement that work will begin immediately on betterments to the city street car system owned by his company. Work will be done under direction of J. W. Hull, assistant chief engineer. O.

MUSKEGON, MICH.—The Muskegon, Ludington and Manistee Electric Railway Company has been incorporated with a capital stock of $1,500,000. The company will construct a line from Muskegon to Ludington and from Ludington to Manistee. The Michigan office will be at Muskegon and the foreign office at Chicago. The incorporators are Thomas Jacobs, Walter Hieston and others.

PEORIA, ILL.—The first incorporation papers of the Peoria, Galesburg & Western Electric Railway Company have been filed. The capital stock is placed at $5,000 and the incorporators are W. T. Irwin, Clifford Ireland, J. W. McDowell, George J. Jobst and William M. Allen. The home office of the company is to be in this city and the purpose of the company is to construct, finance and operate an electric railway.

NEW INCORPORATIONS.

HARTFORD, CONN.—The Griffing-Scofield Electric Company has filed articles of incorporation with a capital stock of $20,000.

LANSING, MICH.—Insulating Materials Company of Detroit has been incorporated with a capital stock of $5,000 to deal in electrical equipment.

GEORGETOWN, S. C.—Georgetown Gas & Electric Company has been incorporated with a capital stock of $100,000 by Clawson Bachman and James T. Hayden, both of Philadelphia.

CITRONELLE, ALA.—The Citronelle Light, Ice & Power Company has been incorporated with a capital stock of $15,000. The incorporators are Daniel E. Smith, who is president, Hubbard Parker and Frank A. Armitage.

NEW YORK, N. Y.—James E. Finegan, of Brooklyn, is a director of a newly chartered firm to be known as Gagen & Butler, which has been incorporated with a capital stock of $15,000 to do contracting and electrical work.

SALT LAKE CITY, UTAH.—Swan Creek Electric Company has been incorporated with a capital stock of $20,000. The directors of the company are B. E. Slusser, Ola Transtrum, E. M. Pugmire, Chester Transtrum and Ezra J. Howell.

QUINCY, ILL.—The Dayton-Dick Company has been incorporated with a capital stock of $30,000 to manufacture magnetos and coils and to deal in all kinds of electrical apparatus. The incorporators are C. E. Epler, August R. Dick and Henry F. Dayton. Z.

NEW YORK, N. Y.—Chute Thornton & Bayley Corporation has been incorporated with a capital stock of $1,000 for the purpose of engaging in business as electrical engineers. The incorporators are Dean W. Chute, Felix R. Bayley and William J. Murphy.

CHICAGO, ILL.—The firm of Harry A. Porter, Incorporated, has been granted articles of incorporation, capitalized at $2,500, for the purpose of buying, manufacturing and selling electrical goods, etc. The incorporators are Harry A. Porter, Roland L. Porter and J. L. Porter.

NEW YORK, N. Y.—Volta Machine Manufacturing Company, Incorporated, has been incorporated with a capital stock of $20,000 to deal in machinery used in the manufacture of electricity. The incorporators are Thomas D. Finizio, Frank V. Giliberti and Antonio Pettraglia, all of New York City.

PROPOSALS.

TRANSFORMERS, ETC.—Bids will be received by W. G. Lenz, until June 23 for furnishing one year's supply of meters and transformers to the city of Rochester, Minn., for use at the electric light plant. A check for 10 per cent must accompany bids. C.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Depot Quartermaster, U. S. Army, San Francisco, Cal., until June 30 under schedule No. 1 for furnishing electrical supplies. For further information apply to John T. Knight, at the above address.

ELECTRIC CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 21 for furnishing the electric conduit and wiring and interior lighting fixtures of a one-story building for the post office at Cartersville, Ga. Copies of drawings and specifications may be obtained from the custodian of the site or from the office of the Supervising Architect.

TRANSFORMERS, ETC.—The City Council, Tacoma, Wash., will receive bids until June 26 for $32,000 worth of transformers and other electrical equipment for the city light and power substation, in anticipation of taking over all of the power business of the Tacoma Railway & Power Company, which had its franchise revoked by the Superior Court recently. For plans and specifications, address Superintendent B. W. Collins, City Hall. O.

ELECTRICAL APPLIANCES.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 1, for furnishing 4,200 feet of single-conductor cable and one electric conveyor, to be delivered at the Navy Yard, Washington, D. C., as per schedule No. 5,567 and No. 5,574 respectively; 6,000 gallons of electrolyte and one motor for operating woodworking tools and shafting, to be delivered at the Navy Yard, Brooklyn, N. Y., as per schedule No. 5,573 and No. 5,577 respectively; and miscellaneous electrical appliances, motor-driven, to be delivered at Mare Island, Cal., as per schedule No. 5,579.

FINANCIAL NOTES.

At the annual meeting of the Westinghouse Electric & Manufacturing Company retiring directors were re-elected.

The United Railways Company which operates the local surburban traction lines of St. Louis, will pay all its outstanding bonds maturing July 1, totalling $1,750,000.

Northern Colorado Power Company elected A. M. Chambers of New York City, president; H. U. Wallace, vice-president and general manager; and A. E. Ward, secretary, to succeed George Best, resigned.

The American Telephone & Telegraph Company now has the largest list of stockholders in its history, the total being not far from 54,000, as compared with 50,000 on January 1, and 47,000 at the beginning of 1912. Sixty thousand shares are held in France, the number being somewhat larger than the English holdings.

Proceeds of the $2,500,000 three-year six-per-cent debentures, recently sold by the New Orleans Railway & Light Company, a subsidiary of the American Cities Company, will be used to pay existing construction indebtedness and to provide about $1,000,000 for new construction in 1913. The remaining $1,500,000 of the $4,000,000 of these debentures authorized, are reserved for construction expenses in 1914.

Announcement is made that an agreement has been reached between the United Properties Company's committee, the F. M. Smith creditors' committee, and N. W. Halsey & Company and E. H. Rollins & Sons to provide tentatively for financing the Oakland Railways, and the San Francisco-Oakland Terminal Railways, which latter company owns and operates the Oakland Traction and Key Route properties.

The Virginia-Western Power Company, which has been organized with a capitalization of $500,000 common and $126,000 preferred stock, with $1,500,000 bonds, will take over the Virginia-Western Electric Company, the Rockbridge Power Corporation, the Covington Light & Power Company, and the Buena Vista Light & Power Company. The new company owns several hydroelectric sites and developments will be made of these. Transmission lines will be constructed uniting the various towns, and, in addition to the hydroelectric plants, a steam power plant will be built as an auxiliary.

The following securities have been listed on the New York Stock Exchange: American Telephone & Telegraph Company, $67,000,000, convertible 4.5-per-cent bonds, due 1933, on official notice of issuance in exchange for outstanding temporary receipts. Chicago Railways Company, $46,795,000, first-mortgage, twenty-year five-per-cent bonds, due 1927.

It is announced that the Light & Development Company of St. Louis has purchased the plant of the Marianna, (Ark.) Light, Power & Water Company from E. C. and John Horner of Helena. The plant operates the street car system of Marianna. The price paid was about $250,000.

A special meeting of the stockholders of the Columbia Gas & Electric Company will vote June 19 on the approval of the issue of $3,000,000 five-per-cent debentures dated July 1, 1913, and payable January 1, 1927, to be exchanged for the preferred and common stocks of the Union Gas & Electric Company, in the hands of the public.

Reorganization plans of the Columbus, Marion & Bucyrus Railway Company, which has recently been sold at receiver's sale, have been completed. A new company will be formed, known as the Columbus, Marion & Bucyrus Interurban Railway Company, and will have a capital stock of $350,000, of which $100,000 will be given to the purchasers of the new $100,000 first-mortgage six-per-cent bonds and $250,000 to the holders of the $500,000 five-per-cent first-mortgage bonds of the old company. New first-mortgage, six-per-cent bonds are to be issued to pay the receiver's claims, outstanding receiver's certificates, expenses of foreclosure and to build a power house and such additional trackage as may be necessary.

Dividends.

Abington & Rockland Electric Light and Power Company, semi-annual of $4, payable July 1 to stock of record June 19.

American Cities Company, the regular semi-annual dividend of three per cent on the preferred stock, payable July 1 to stock of record June 20.

Asheville Power & Light Company, the regular quarterly preferred dividend of 1.75 per cent, payable July 1 to stock of record June 23.

Boston & Worcester Electric Company; a preferred dividend of $1 per share, payable July 1.

Carolina Power and Light Company; quarterly of 1.75 per cent on preferred, payable July 1 to stock of record June 23.

Central States Electric Corporation; quarterly of 1.75 per cent, payable July 1 to stock of record June 10.

Cincinnati Gas and Electric Company; quarterly of 1.25 per cent, payable July 1 to stock of record June 14.

Cincinnati Street Railway Company; quarterly of 1.5 per cent, payable July 15 to stock of record July 5.

Consumers Power Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable July 1 to stock of record June 17.

Duluth-Superior Traction Company; a quarterly preferred dividend of one per cent, and a common dividend of one per cent, both payable July 1 to stock of record June 21.

Eastern Texas Electric Company; semi-annual of $3, payable July 1 to stock of record June 18.

Mexican Light Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable July 1 to stock of record June 17.

New York Edison Company; the regular quarterly dividend of 1.5 per cent, amounting to $750,000, which goes to Consolidated Gas, owning all the Edison stock.

New Orleans Railway & Light Company; the regular quarterly dividend of 1.25 per cent on the preferred stock, and a dividend of one per cent on the common stock, payable June 30.

Otis Elevator Company; the regular quarterly dividend of 1.5 per cent on preferred and one per cent on common, payable July 15.

Pacific Telephone & Telegraph Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable July 15.

Philadelphia Company; quarterly of 1.75 per cent on common, payable August 1 to stock of record July 1, and a semi-annual of 2.5 per cent on the old preferred, payable September 2 to stock of record August 9.

Providence Telephone Company; quarterly of $1, payable July 1 to stock of record June 20.

Twin City Rapid Transit Company; the regular quarterly dividend of 1.75 per cent on preferred and 1.5 per cent on common, payable July 1 to stock of record June 20.

United Light & Railways Company; regular quarterly dividends of 1.5 per cent on the first preferred stock, 0.75 on the second preferred stock and one per cent on the common stock, payable July 1 to stock of record June 14.

United Utilities Company; the regular quarterly dividend of 1.75 per cent on its preferred stock, payable July 1, to stock of record June 21.

Washington, Baltimore & Annapolis Railway Company; quarterly of 1.5 per cent on the preferred, payable June 30 to stock of record June 21.

West India Electric Company, Limited; quarterly of 1.25 per cent, payable July 2 to stock of record June 23.

Western Union Telegraph Company; the regular quarterly dividend of 0.75 per cent, payable July 15 to stock of record June 20.

Report of Earnings.

LOS ANGELES GAS AND ELECTRIC.

The Los Angeles Gas and Electric Corporation reports for the year ended December 31, 1912, as follows:

Operating revenue	$4,284,809.44	
Operating expenses	2,472,683.97	
Net oper. revenue		$1,812,125.47
Interest and div.	$ 21,320.68	
Sinking fund account	11,181.25	
Total		$ 32,501.93
Gross income		$1,844,627.40
Deductions—		
Interest		$ 398,068.76
Surplus for year		$1,446,558.64

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 16.	June 9
American Tel. & Tel. (New York)	127½	127½
Commonwealth Edison (Chicago)	127	*131
Edison Electric Illuminating (Boston)	260	255
Electric Storage Battery, common (Philadelphia)	47	45
Electric Storage Battery, preferred (Philadelphia)	47	45
General Electric (New York)	135⅞	134
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1⅝	1⅝
Massachusetts Electric, common (Boston)	12½	13½
Massachusetts Electric, preferred stamped (Boston)	68	69
National Carbon, common (Chicago)	111	*116½
National Carbon, preferred (Chicago)	113½	*115
New England Telephone (Boston)	135	142½
Philadelphia Electric (Philadelphia)	21⅜	21½
Postal Telegraph and Cables, common (New York)	77	79
Postal Telegraph and Cables, preferred (New York)	64½	66
Western Union (New York)	62	60
Westinghouse, common (New York)	58	58
Westinghouse, preferred (New York)	105⅞	104

*Last price quoted.

PERSONAL MENTION.

F. A. LAWS, associate professor at Massachusetts Institute of Technology, has been promoted to the post of professor of electrical engineering.

N. S. MARSTON, assistant instructor at Massachusetts Institute of Technology, has been promoted to the grade of instructor in electrical engineering.

J. C. HOBART has been elected president of the Triumph Electric Company, Cincinnati, O., succeeding to the vacancy caused by the death of his father, William N. Hobart. The new head of the company has been secretary and general manager since its organization in 1889. He is succeeded as secretary by GRAHAM P. HUNT.

A. C. CHOATE, who has been engaged in central-station work at Richfield Springs, N. Y., has been appointed local manager of the Kentucky Public Service Company at Hopkinsville, Ky. He succeeds DAN BLAKE, who has been in temporary charge, and who returns to Nashville, Tenn., to assume an executive position with the Tennessee Power Company.

B. W. DUNN, of New York, Chief Inspector of the Bureau of Explosives and Combustibles of the American Railway Association, has been elected to membership in the Council of Underwriters' Laboratories. The work in safeguarding life and property which the railway companies have been carrying forward through Col. Dunn's bureau is similar in many respects to that undertaken by some departments of the laboratories. The addition of Col. Dunn to the laboratories' council is expected to aid the establishment of uniformity in fire-prevention engineering practices.

THEODORE HARDEE has been appointed chief of the Liberal Arts Department of the Panama-Pacific International Exposition. The Liberal Arts exhibit will include electrical methods of communication, including wireless telegraphy, and telephony, line telegraphy and telephony, and improvements in fire alarm and police signals. Mr. Hardee was principal assistant to Walter B. Stevens, who was the general secretary and also director of exploitation for the St. Louis World's Fair in 1904. Mr. Hardee also acted as St. Louis representative at the Lewis and Clark Exposition.

CHARLES S. CUTTING has resigned as Probate Judge for the City of Chicago, and on the first of September will form a partnership with CHARLES S. HOLT and W. P. SIDLEY under the firm name of Holt, Cutting & Sidley. Mr. Cutting has been elected four times and has served 13 years. He takes the place of the late Arthur D. Wheeler. The firm is counsel for a number of public utility corporations, notably the Bell Telephone Company, and Mr. Sidley is vice-president and general counsel of the Western Electric Company. Chicago electrical men will remember the remarkably lucid and interesting address made before the Electric Club by Judge Cutting recently.

GEORGE W. MAGALHAES, who has served a year as assistant sales manager of the Toronto Electric Light Company, Limited, of Toronto, Ont., has been appointed general inspector of that company. He was born in 1876 at Sao Paulo, Brazil, came to the United States in 1892 and has since made his residence in this country and Canada. Mr. Magalhaes was graduated from the School of Mines of Columbia University with the degree of electrical engineer in 1897. His record of work and experience is as follows: Two years laying out and installing electric storage batteries for central station and street railway service. Two years with the Electric Controller & Manufacturing Company, of Cleveland, Ohio, designing and selling electric controllers for rolling mill machinery, cranes and ore-handling apparatus. Six years with the New York Edison Company in the engineering department laying out and inspecting substations and the inspection of the electrical contract work on Waterside Station No. 2. Two years as inspector for the department of Water Supply, Gas and Electricity of New York City, giving especial attention to the electrification of Queensboro and Manhattan Bridges and the public buildings on Blackwell's Island. Canadian representative of the L. K. Comstock Company, electrical contractors.

OBITUARY.

CHARLES W. MORSE of Haverhill, Mass., died suddenly on Wednesday, June 11, at Gainesville, Fla., at the age of sixty years. He was president of the Gainesville Gas & Electric Power Company, and was connected with several electric companies in the East. His death, which took place at a hotel, was from cirrhosis of the liver.

GEORGE B. FRANCIS, widely known in engineering work, died in New York City, last week from hemorrhage of the brain, in his fifty-seventh year. He lived in New York for ten or twelve years, previously living in Providence, R. I. He received his education in the public schools of his native town and in the Hartford High School. He then went to Providence as student in the engineering department of the Providence water works for three years, after this serving in the city engineers department until November, 1881. From that date until May, 1887, he was connected successively with the engineering department of the West Shore Railroad, N. Y., the Oregon Railway and Navigation Company of Oregon, and numerous other companies. In May, 1887, Mr. Francis returned to Providence as principal assistant engineer of the New York, Providence and Boston Railroad, remaining in that position until March, 1892, when he was appointed resident engineer of the New York, Providence and Boston and Old Colony Railroad Terminal Company, designing and constructing the Providence terminals. He became on July 1, 1896, resident and acting chief engineer of the Boston Terminal Company, designing and constructing the South Terminal Station in Boston, one of the largest and most capacious passenger terminals in the world. Completing this work in February, 1900, he then became chief engineer of the Providence Street Railway system, serving until June, 1902, when he accepted an appointment as the head of the civil-engineering department of Westinghouse, Church Kerr & Company, in New York, since which date he had been engaged in civil-engineering work connected with the terminal station of the Pennsylvania Railroad in New York City, as well as consulting engineer on construction work in Rhode Island, Massachusetts, New York, New Jersey, Pennsylvania, Virginia, Michigan, Missouri and Georgia. Mr. Francis was a member of the Boston Society of Civil Engineers, the American Society of Civil Engineers, the Institution of Civil Engineers of London and the New York Railroad Club. He was a frequent contributor to the current technical periodicals, and in 1910 was awarded a gold medal at the Paris Exposition in connection with the exhibit of the Boston Terminal Company. The esteem in which Mr. Francis was held in New England was demonstrated in 1909, when he was elected president of the Boston Society of Civil Engineers. It is said that he was the first non-resident of New England to be made the head of this celebrated association of engineers. On April, 1882, Mr. Francis married Florence Louise Greene of New York City.

NEW PUBLICATIONS.

INTERNATIONAL TELEGRAPH CONGRESS—The Transactions of the International Congress of Practical Telegraphy, which was held in Italy in 1911, is being distributed. It is a well printed and profusely illustrated volume of 184 pages with appendices comprising 151 pages additional. The volume is being distributed by the Minister of Posts and Telegraphs, Rome.

BOARD OF SUPERVISING ENGINEERS.—The fourth annual report of the Board of Supervising Engineers, Chicago Traction, for the fiscal year ending January 31, 1911, has been published as a 524-page volume. Besides giving complete statistical information on the rehabilitation and extension work carried on during the year, it gives a general summary and many detailed accounts of special features of the work of great technical interest, also a digest of all official meetings, and the full text of the ordinance by which the urban consolidated traction property became part of the general street-railway system over which the Board has jurisdiction. The report is well bound and illustrated with numerous maps, diagrams and half-tones.

DATES AHEAD.

American Institute of Electrical Engineers. Thirtieth annual convention, Hotel Otesaga, Cooperstown, N. J., June 23-27.

Society for the Promotion of Engineering Education. Annual convention, Minneapolis, Minn., June 24-26.

Canadian Electrical Association. Annual convention, Toronto, Ont., June 25-27.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Boston, Mass., June 25-28.

Electrical Contractors' Association of the State of Missouri. Annual meeting, St. Louis, Mo., July 12.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 15-18.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16-19.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach, Mich., August 18-21.

Association of Edison Illuminating Companies. Annual convention, Cooperstown, N. Y., September 8-11.

American Electrochemical Society. Annual meeting, Denver, Colo., September 9-11.

Northwest Electric Light and Power Association. Annual convention, Seattle, Wash., September 10-12.

Pennsylvania Section, National Electric Light Association. Annual convention, Delaware Water Gap, Pa., September 16-18.

Illuminating Engineering Society. Annual convention, Pittsburgh, Pa., September 22-26.

With the Electrical Manufacturers

Sundh Electric Company, New York City, has issued several additional pages to its loose-leaf catalog. These deal with Sundh gauge-type pressure regulators, pressure regulator panels, contactors and the new Sundh time switch. The company has also called attention to some attractive reductions in prices.

Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa., has issued Catalog 6 dealing with its electrical specialties. Among these are included push-button flush wall switches, wall receptacles for surface, screw or polarity plugs, indicating heater receptacles, shallow cast-iron switch boxes and floor boxes, uni-sectional wall cases, remote-control vacuum-cleaning stations, panelboards, etc. The catalog is well illustrated throughout.

Steel City Electric Company, Pittsburgh, Pa., manufacturer of conduit fittings and specialties, has appointed R. W. Young as its sales representative at the New York office, 27 Thames Street. His territory will include New England, New York City, and the territory immediately continguous thereto. The company also appointed Dale D. Scarborough as its sales representative at the Philadelphia office, which is located at 5522 North Third Street and includes a large amount of territory in Eastern Pennsylvania, New Jersey, Delaware, Maryland and Virginia.

Busch—Sulzer Brothers—Diesel Engine Company, St. Louis, Mo., has ready for distribution some interesting information relating to Diesel oil engines in central stations in cities of 2,000 to 10,000 population. Announcement is made that of the Diesel plants in the United States installed in the last 10 years, 44 per cent have been purchased by central stations, electric light, ice and water plants in cities of that size, and run from 100 horsepower to 1,000 horsepower. Full information respecting these equipments will be furnished to those interested upon request.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued descriptive leaflet No. 3679 covering electric-vehicle battery-charging switchboards and motor-generator sets, which are described and illustrated in detail. Special mention is made of the sectional switchboard which has proven very satisfactory for this class of work, enabling additions to be made to the outfit from time to time with slight expense. There has also been issued folder No. 4255 covering Westinghouse type PG porcelain strain insulators. These have high mechanical strength and are suitable for use for 1,500-volt direct-current railway work and for 2,200-volt transmission lines.

The Emerson Electric Manufacturing Company, 2030 Washington Avenue, St. Louis, Mo., in the June issue of *The Emerson Monthly,* which is its well known house organ, has a very interesting article entitled "Ventilating Picture Theaters." This includes a number of diagrams showing the most approved method for ventilating auditoriums of moving-picture theaters. Several alternative plans are described, the best of which involves the use of two or more exhaust fans on either side of the stage and a series of bracket fans on each side of the auditorium. In the same issue of the *Monthly* is a brief article calling attention to the installation of 240 special Emerson fans in the Maryland Hotel, St. Louis, thus providing a fan in every guest room throughout the establishment.

The Electric Storage Battery Company, Philadelphia, Pa., has contracted to furnish for the Laclede Gas Light Company, St. Louis, Mo., a large exciter battery to consist of 56 cells of type G-9 Exide accumulator in G-13 lead-lined tanks. This battery will be located at the new central station of the Laclede Company and will be floated at all times on the exciter circuit, thus insuring the latter against any interruptions in service. It has been customary heretofore to have both steam-driven and motor-driven exciter sets in operation at all times, so as to make sure of continuity of excitation. The installation of the new exciter battery will permit shutting down the steam-driven exciter set. The capacity of this battery is 320 ampere-hours at the one-hour discharge rate.

Safety—Armorite Conduit Company, Pittsburgh, Pa., announces that Garland patent No. 611,900, relating to treatment and enameling of metal surfaces, and particularly the interior surface of metal pipes, commonly known in the trade as the "Garland sand-blasting patent," has been sustained by the upper courts. This Garland patent is held by the Safety-Armorite Conduit Company through assignment of the patentees. The company states that the Mark Manufacturing Company, of Zanesville, O., and Evanston, Ill., used this patent in its work, and upon suit for infringement in the District Court of the United States for the Southern District of Ohio, the patent was sustained, and the Mark Manufacturing Company restrained from using same by means of injunction. The case was then appealed to the United States Circuit Court of Appeals, where the validity of the patent and the charges for infringement of its claims were sustained, and an accounting and injunction granted by a unanimous decision of the Circuit judges. The decision was handed down by the Court under date of June 3 last.

Record of Electrical Patents.

Issued by the United States Patent Office, June 10, 1913.

1,063,947. Magneto. H. Adelsohn, Brooklyn, N. Y. Combined with a magneto is a distributor.

1,063,950. Electric Current-Controlling Device. A. E. Berdon, assignor to Esterline Co., La Fayette, Ind. Includes a permanent magnet and current and pressure coils.

1,063,991. Shoe-Shining Machine. R. R. McElhany, assignor to National Electric Shoe Shining Machine Co., Pittsburgh, Pa. Driven by an electric motor.

1,063,996. Mechanical Joint for Vacuum Tubes. D. McF. Moore, assignor to General Electric Co. A joint coupling for glass tubes of Moore tube lamps.

1,063,999. Apparatus for Electric Welding. C. H. Murray, L. R. Brink and W. K. Malmstrom, assignors to Barnhart Bros. & Spindler, Chicago, Ill. Has a means for forcing a clamping die toward the electrode.

1,064,025. Motor Controller. F. L. Stone, assignor to General Electric Co. Includes a pawl and ratched mechanism, one part of which is driven by the controller and the other by the motor so as to permit the controller to follow the movement of the motor.

1,064,026. Electrical Generator. T. K. Strand, Rolette, N. D. Has a special gear connection to a windmill.

1,064,033. Junction Box. J. F. Wagner, assignor to Arnold-Wagner Electric Co., South Bend, Ind. Special grooves to form the knockouts.

1,064,037. Means for Providing Constant and Known High Temperatures. W. R. Whitney, assignor to General Electric Co. A tempering furnace with a closed double-wall jacket electrically heated.

1,064,042. Electric Heater for Sealing-Wax and the Like. H. P. Ball, assignor to General Electric Co. Includes a pivoted heating pan that can be disengaged from the heating element.

1,064,049. Apparatus for Recording Calls Made by Telephone. E. H. Bridge, Spotswood, Victoria, Australia.

Has two sets of magnet coils, one placed above the other.

1,064,054. Card-Elevating Mechanism for Time-Recorders. C. M. Crook, assignor to Stromberg Electric Co., Chicago, Ill. Has electrically operated means for moving the mechanism.

1,064,064. Method and Apparatus for Producing a Gaseous Reaction by a Silent Discharge. M. W. Franklin, assignor to General Electric Co. Includes a pair of concentric electrodes, the inner one composed of sections arranged to permit air to pass through the electrode and between the sections.

1,064,065. Ozonator. M. W. Franklin, assignor to General Electric Co. An amplification of the foregoing.

1,064,078. Electric Welding Machine. L. E. McKinnon and A. W. Southall, assignors to McKinnon Chain Co., Buffalo, N. Y. Has a movable carriage for the electrode, a seat block adjustably secured to the carriage, and a yielding connection between the block and electrode.

1,064,079. Electric Welding Machine. L. E. McKinnon, assignor to McKinnon Chain Co. Includes make and break mechanism to produce an intermittent welding current.

1,064,089. Motor Vehicle. W. P. Rayner, Philadelphia, Pa. Includes an engine, a generator driven thereby and supplying current to the motors; the engine may be connected directly to the drive wheels.

1,064,096. Electrical Switch. W. M. Scott, assignor to Cutter Electrical & Mfg. Co., Philadelphia, Pa. Covers mechanical features of a circuit-breaker.

1,064,103. Electric Air-Compressor. S. P. Smith, Berkeley, and C. W. Keiver, Oakland, Cal. A solenoid operates the piston.

1,064,104. Electric Timer for Explosive Engines. W. M. Steele, Worcester, Mass. A rotating spindle carries spaced contact terminals.

1,064,115 and 1,064,116. Vapor Electric Device. E. Weintraub, assignor to General Electric Co. A double-walled mercury-vapor lamp, the outer tube being of glass and the inner one of quartz. The second patent provides for a capillary connection between the tubes.

1,064,122. Timer for Ignition Systems. W. N. Barrett, Meadville, Pa. Has two contact points, one movable axially and rotatively.

1,064,131. Power-Factor Indicator. J. R. Craighead, assignor to General Electric Co. The movable member consists of coils at right angles to each other, and each supplied through phase-splitting means.

1,064,137. Electric Clock. J. F. Engle, assignor to L. M. Parker, Cleveland, O. Includes an armature on the arbor of the main spring.

1,064,138. Low-Water Alarm. C. W. Ford, Pittsburgh, Pa. An electric alarm for a boiler.

1,064,142. Safety Device for Railroad Trains. W. F. Greene, Huntingdon, Pa. Breaking of any arch bars of the truck breaks an electric circuit and this releases an air whistle.

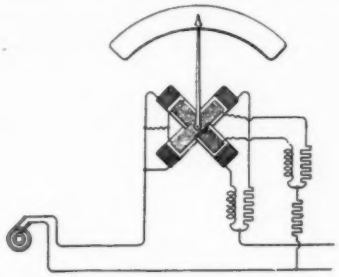
1,064,176. Interrupter Device for Ignition Systems. J. M. Smith, Philadelphia, Pa., assignor of one-half to C. A. Magruder. Comprises two interrupter arms operated by revolving cams.

1,064,177. Current Distributer and Timer. J. M. Smith, assignor of one-half to C. A. Magruder. A pawl operates the movable contact.

1,064,190. Electric Air-Heater. L. A. Bill, assignor to J. C. Kent, Cambridge, Mass. The heating element in the tube consists of a conical drawn-out helix.

1,064,205. Motor-Accelerating Device. E. L. Gale, Sr., assignor to Otis Elevator Co., Jersey City, N. J. A drum-type controller in which the drum is geared to the motor.

1,064,210 and 1,064,211. Galvanic Cell. A. Heil, assignor to C. Hubert and S. Stern, New York, N. Y. The first patent covers special means for keeping the electrodes concentric. The second relates to a depolarizer made by saturating carbon with manganese nitrate dissolved in alcohol.



1,064,131.—Power-Factor Indicator.

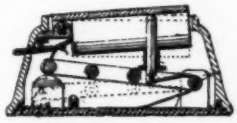
1,064,224. Motor-Controlling Mechanism. J. D. Ihlder, assignor to Otis Elevator Co., Jersey City, N. J. Provides automatic and manual control of the dynamic braking circuit.

1,064,228. Automatic Starting-Switch. C. D. Knight, assignor to General Electric Co. The rotary switch is actuated by an electromagnet through a ratchet.

1,064,258. Electric Heater. G. E. Sharpe, Stubenville, O. The heating element rests on a shelf at the bottom of a reflector.

1,064,259. Motor Vehicle. P. Synnestvedt, Pittsburgh, Pa. A single motor is supported back of the rear axle and conected by chains to each rear wheel.

1,064,290. Time-Actuated Electric Switch. D. A. Cato, Springfield, Ill. The switch is conected to the clock disk through links.



1,064,358.—Disk Stove.

1,064,295. Support for End Turns or Connections of Coils for Dynamo-Electric Machines. W. F. Dawson, assignor to General Electric Co. Provides a special end frame to which the coils are clamped.

1,064,310. Dynamo-Electric Machine. W. J. Foster, assignor to General Electric Co. The multipolar field magnet has a number of coils per pole contained in special slots in the core.

1,064,318. Electrical Switch. H. R. Gilson, assignor to National Metal Molding Co., Pittsburgh, Pa. Includes a multiple spring-arm, a longitudinally movable key shaft and a dog.

1,064,325. Wave-Meter. R. Hirsch, assignor to Dr. Erich F. Huth, G. M. B. H., Berlin, Germany. Combined with a condenser including a fixed and a rotary member is a motor on whose shaft the rotary member is carried.

1,064,329. Ignition Device. T. Hubert, assignor to American Circular Loom Co., Boston, Mass. A combined magneto and transformer.

1,064,330. Electrical Heater. A. C. Hulbert, San Francisco, Cal. A flat ring-shaped heating element can be placed in the bottom of a cup so that the handles of the element and cup fit together.

1,064,338. Electric Welding Process. E. Katzinger, Chicago, Ill. One of the sheets is provided with projections, the sheets are then pressed together and the current passed through the projections, forming a set of spot welds.

1,064,358. Electric Stove. C. Mettler, assignor of one-third each to H. W. Leete and G. C. Moore, New Haven, Conn. A disk stove in which the upper surface is hinged so that when a vessel is placed thereon the circuit is closed, other times being open.

1,064,370. Multiple-Service-Battery Cabinet. G. L. Patterson, assignor to A. C. Patterson, New York, N. Y. The under sides of the hinged shelves have screw terminals for series of dry cells, the series terminals being connected to busbars.

1,064,373. Telegraph-Transmitter. E. C. Phillips and T. Rhodus, assignors to Phillips Telegraph Instrument Co., Phoenix, Ariz. Consists of a primary driving wheel constantly rotating, a circuit make-and-break mechanism, a series of character devices comprising a driven wheel provided with means for imparting intermittent action to the make-and-break device.

1,064,402. Pipe-Conduit Fitting for Electric Installation. W. H. Vibber, assignor of one-half to Gillette-Vibber Co., New London, Conn. Consists of a two-part fitting, with a split insulator in the throat, that may be clamped on conduit after the wires are in place.

1,064,411. Power-Driven Trolley for Fixed-Tongue-Switch Track Systems. N. Whichello, Muskegon, Mich. A motor-driven carriage is suspended from an I-beam track.

1,064,412. Vacuum-Cleaner. W. T. White, St. John, N. B., Canada. An electric motor has a suction fan at each end of its vertical shaft.

1,064,422. Pull Switch for Wall Boxes. F. Barr, New York, N. Y. The flaring of a disk causes the chain to draw away from the contacts when pulled.

1,064,423. Socket for Lamps, Etc. F. Barr, New York, N. Y. An insulating cap lining is secured by metallic clips.

1,064,424. Socket Construction. F. Barr. The cap and body are secured together by a movable interlocking ring.

1,064,425. Pull Socket. F. Barr. Special lugs hold the chain guide in place.

1,064,426. Electric-Switch Socket. F. Barr. A modification of the above.

1,064,428. Reflector. W. A. F. Becker, assignor to Thomas Cusack Co., Chicago, Ill. A sheet-metal sign reflector for two lamps.

1,064,433. Method of Reducing Telephonic Disturbances. O. B. Blackwell and G. A. Anderegg, assignors to American Telephone & Telegraph Co. Consists in determining the differences in capacities of the conductors of one

group with relation to those of another, and then transposing the capacities of the groups so that they tend to balance.

1,064,434. Alternating-Current Rectifier. D. M. Bliss, assignor to Thomas A. Edison, Inc., West Orange, N. J. A special motor-driven commutator.

1,064,441. System for Vehicle Control. J. T. Cade, Arcola, N. J., assignor to Federal Signal Co. An electrically operated track alarm controlled by the train.

1,064,461. Speed-Indicator. L. H. Dyer, Greenwich, Conn. Electrically actuated and time-controlled.

1,064,471. Thermotelephone or the Like. B. Gwózdz Schöneiche, Germany. Combined with a plastic hardening body is a Wollaston wire passing through and having a bent portion projecting, and a metal body surrounding the plastic body and electrically connected to the wire.

1,064,492. Muffler Attachment for Telephones. G. Kracker, Philadelphia, Pa. A hood surrounds the mouthpiece.

1,064,506. Electrically-Illuminated Sign. J. M. Loughlin, assignor to Thomas Cusack Co., Chicago, Ill. Consists of a closed box with oppositely and downwardly inclined converging side walls, to which the lamp sockets are secured.

1,064,512. Electromagnet. F. W. Martini, Chicago, Ill. Has a solid core and an extensible plicatile armature, the first lamina of which is always in contact with the core.

1,064,515. Electric Signal-Lamp. A. K. Miller, Peekskill, N. Y. A vehicle tail lamp surrounded by a colored globe with a clear panel at one side.

1,064,519. Means for Locking Traveling Cranes. W. K. Monroe, assignor to Brown Hoisting Machinery Co., Cleveland, O. Comprises a series of stops and electrically controlled oscillating tongue pieces.

1,064,524. Attachment for Electric Fans and the Like. W. Nelson and J. W. Ruggaber, assignors to Racine Electric Co., Racine, Wis. A table fan with an upwardly and outwardly flaring distributing surface over the blades of the fan.

1,064,541. System of Distributing Electric Energy. I. J. Reuter and F. P. MeDermott, Jr., assignors to Remy Electric Co., Anderson, Ind. A switch for connecting either of two sources to the ignition circuit.

1,064,571. Base for Electric Incandescent Lamps. P. G. Triquet, Paris, France. The screw shell and base contact are mounted on an insulating sleeve.

1,064,599. Telephone Attachment. W. Bimson, Philadelphia, Pa. For holding the receiver to the user's ear.

1,064,648. Door-Operating Means. A. Hohne and H. Krake, Leipzig Germany. The door handle closes the circuit of the motor that swings the door.

1,064,658. Incubator-Alarm. C. W. Kelley, Wellington, Tex. An electric alarm actuated by a thermostat.

1,064,669. Alternating-Current Generator. A. Scherbius, J. Jonas and H. Meyer-Delius, assignors to Aktiengesellschaft Brown, Boveri & Cie., Baden, Switzerland. A series-type commutator generator having compensating field and armature windings and means for stabilizing comprising two choke coils, one in parallel with the field and the other in parallel with the compensating and armature windings.

1,064,671. Treatment of Steel and Iron Surfaces. W. S. Simpson, London, England. Consists in fusing electrically and alloying the surfaces while in a vacuum.

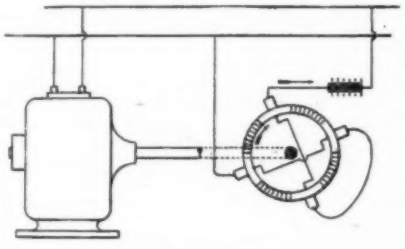
1,064,673. Danger-Signal for Railways. C. N. Steevens, Owego, N. Y. A crossing signal electrically actuated.

1,064,681. Racing Amusement Apparatus. E. Cawthon and F. L. Thornton, Seattle, Wash. The vehicle is driven by an electric motor with a rheostatic controller; means driven by the motor effect intermittent adjustments of the rheostat arm.

1,064,682. Electrical Apparatus for Transmitting and Receiving Signals. A. T. Dawson and G. T. Buckham, assignors to Vickers Limited, London, England. Includes a magneto, a counter, and a rotary switch.

1,064,685. Electric Lighting Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A mercury-vapor tube with a solid conductor connecting the electrodes when the lamp is not in operation, and a solenoid for separating the electrodes in starting.

1,064,686. Gas or Vapor Electric Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A modification of the above with two electromagnets in place of the solenoid.



1,064,434.—Rectifier.

1,064,687. Vapor Electric Device. P. Hewitt, assignor to Cooper Hewitt Electric Co. A modification of the above.

1,064,688. Electric Lighting Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A further modification utilizing a long thin filament of mercury for temporarily connecting the electrodes.

1,064,689. Vapor Electric Device. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. The tube is tilted for starting.

1,064,690. Automatic Starting Device for Vapor Lamps. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A modification of the foregoing.

1,064,691. System of Electrical Distribution. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A further modification in which the starting device consists of a transformer.

1,064,696. Clamp Controller-Handle for Motorneers. J. B. Jackson, Denver, Colo. Relates to mechanical details of a device for preventing too rapid turning on of the power.

Reissues.

13,572. Selective System. E. R. Carichoff, assignor to General Electric Co.. Original No. 1,057,035, dated Mar. 25, 1913. Relates to the connections of a dynamotor for developing 600 volts on a 1,200-volt railway system.

13,573. Motor-Starter. C. Jewell, assignor to Jewell Electric Co., Baltimore, Md. Original No. 1,035,593, dated Aug. 13, 1912. An automatic starter with solenoid control mechanism.

13,575. Insulated Rail Joint. E. F. Schermerhorn, assignor to Rail Joint Co., New York, N. Y. Original No. 1,006,597, dated Oct. 24, 1911. Includes a joint-bar having electrical bearing contact with the head of one rail and insulated bearing with head of the other.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired June 16, 1913.

561,958. Automatic Electric Switch. W. S. Barstow, Brooklyn, N. Y.

561,970. Electric Railway Switch. W. R. Daggett, Dayton, O.

561,975. Electrogalvanic Belt. A. Dow, Wooster, O.

561,977. Electrical-Energy Indicator. T. Duncan, Fort Wayne, Ind.

561,982. Electrical Pilot or Signal. H. H. Franklin, Brooklyn, N. Y.

562,004. Telegraphy. E. F. G. Law, London, England.

562,009 and 562,010. Telephone Switchboard. G. S. Maxwell, Richmond, Va.

562,011. Telephone System. G. S. Maxwell.

562,012. Telephone Switchboard. G. S. Maxwell.

562,013. Telephone Switch. G. S. Maxwell.

562,019. Primary Battery. R. P. Osgood, Salem, Mass.

562,030. Pencil for Arc Lamps. I. L. Roberts, Brooklyn, N. Y.

562,034. Fire-Alarm Signal Box. J. J. Ruddick, Newton, Mass.

562,062. Regulating Alternating Motors. A. H. Armstrong, Schenectady, N. Y.

562,064. System of Telephonic Exchange. S. Berditschewsky (called Apostoloff), London, England.

562,090. Electric Arc Lamp. M. S. Okun, New York, N. Y.

562,097. Device for Removing Insulation from Electric Wires. A. E. O. Rieckel, Brooklyn, N. Y.

562,100. Controller for Electric Cars. E. A. Sperry, Cleveland, O.

562,107. Electric Rail-Bond. W. H. Wiggin, Worchester, Mass.

562,116. Controller for Electric Motors. E. A. Bryant, Washington, D. C.

562,118. Emergency Electric Brake. B. F. Card, Brooklyn, N. Y.

562,132. Trolley for Electric Railways. M. T. Graf, Buffalo, N. Y.

562,142. Electric Switch. J. F. McElroy, Albany, N. Y.

562,179. Dynamo-Electric Machine and Electric Motor. J. G. Germann, and F. B. Downing, Erie, Pa.

562,209. Electric Distributing System. R. R. Bowker, Brooklyn, N. Y.

562,216. Electric Railway System. C. Coerper, Cologne, Germany.

562,235. Electric Burglar-Alarm. H. Rohrdantz, Buffalo, N. Y.

562,260. Pliers or Similar Tool. B. L. Toquet, Westport, Conn.

562,261. Testing-Joint for Electric Conductors. B. L. Toquet.

562,313. Electric Arc Lamp. O. S. Lyford, Jr., Chicago, Ill.

562,318. Railway Signal. F. McBrien, Newark, N. J.

562,331. Automatic Power Controller for Elevators. J. H. Laing, Pittsburgh, Pa.